ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 68. CHICAGO, SATURDAY, JUNE 17, 1916. No. 25.

EDITORIALS

COLLECTING ACCOUNTS.

The importance to the electrical contractor of the prompt collection of accounts is perhaps greater than to the average man in other lines of business. Delinquent accounts tie up the resoures of the contractor and make it essential that he have greater financial resources than would be otherwise necessary. Moreover, the loss of interest upon the money which is thus tied up and unavailable for carrying on other business is a direct loss. The difficulties of collection are well known and when the contractor has not carefully studied the best methods of managing this end of the business he is likely to let accounts run for longer periods than are advantageous. It is often harder for the contractor to collect the debts which are owing to him than it is to get the orders represented thereby.

There are two points of prime importance to be considered in this connection. One is the method to be used to secure prompt payments and the other is the careful scrutiny of the credit of customers before orders are accepted. The reputation for acceptable credit involves two points; first, the ability to pay, and second, the willingness to make the payment when it becomes due. Many individuals and firms who are not lacking in the first requisite will delay payments as long as possible, and thus largely detract from the desirability of their contracts and from the profits of the contractor. Consequently great care should be exercised by the electrical contractor in extending credits and full investigation should be made of the reputation of every one applying for business relations upon any other than cash terms.

Deferred payments represent an expense both in the direct cost of collection and repeated sending of bills, and in the loss of interest upon the face value of the account. Any method which will speed up collections will consequently effect a double saving. One method for doing this which has worked out very satisfactorily for a number of contractors is to allow discounts for prompt payment. Such a discount is partially paid for by the saving as compared with a deferred payment and the remainder may well be covered by an appropriate advance in contract prices. When such prices are offered it should be with a definite statement of the discount for prompt payment, so that any comparison with others may be made upon the basis of net prices. Emphasis should be placed upon the necessity of payment within a definite period to secure the specified discount, and insistence should be made upon full payment in cases where this period is overrun. This method deserves a trial by any electrical contractors who have found their collections to constitute a chronic difficulty.

ELECTROLYTIC HYPOCHLORITE FOR LAUNDRIES.

The use of chemicals, many of which have deleterious effects upon articles of clothing, has become common in laundries, the object being to facilitate washing processes and to bleach uncolored fabrics to a pure white. The use of such chemicals is not relished by the average patron of the laundry and it tends to discourage the patronage of a certain class of customers. Also it represents an outlay for material which is a very appreciable item of expense. Any means of attaining the same object by a cheaper and better process should consequently be welcomed by laundries generally.

An article upon other pages of this issue describes an installation in the Model Laundry at Nashville, Tenn., in which an electrolytic process has been applied which both cleanses and sterilizes the fabrics which are subjected to this process. The electrolysis of salt water causes the formation of sodium hypochlorite, a substance which has distinct disinfecting and antiseptic properties. A small quantity of chlorine is also liberated and a bleaching effect is obtained. A very small quantity of these materials is sufficient to effect the desired purpose and the current need be applied to the solution for but a short time. The germicidal action is a distinct benefit where clothing and other fabrics from all sources are passed through the laundering process together.

The use of electrical power in the laundry has been making steady progress, but its usual application is in driving motors and heating irons and mangles. The extension of its use for electrolysis represents another application which improves the laundering process, reduces its cost, and adds to the load of the central station. There should be many opportunities for introducing this process in other cities with benefit to all concerned.

A notable application of this process on the British hospital ship *Aquitania* has recently been reported. In that case ordinary sea water is used as an electrolyte and the resulting product is applied not only in the laundry, but also in the swimming bath, for different disinfecting purposes about the ship and for surgical use. It is also applied for the purification of drinking water, one part in one million sufficing in this case.

REDUCING THE PEAK LOADS.

In the operation of each of the electrical utilities there is a certain period of the day when the load reaches a maximum. In the case of the electric central station this maximum is usually encountered shortly after dusk, when the greatest demand for lighting comes on, and it is this maximum load that determines the necessary capacity of the generating equipment and the distributing lines and apparatus of the power company. In the case of electric street railways there is a similar period of maximum traffic when the demand for cars and power is the greatest and when the largest number of employees is required. In the telephone business, similarly, the largest number of switchboard operators is demanded by the amount of traffic during the busiest hour of the day, and the switchboards must be designed to meet this period of most dense traffic.

Anything that can be done to improve the load-factor and give a better distribution of the demand for service will relieve the troubles of the operating manager and reduce the necessary investment for equipment. One way in which this could be accomplished, to a slight degree at least, would be in altering the hours of labor of a portion of the community, since this would result in a better distribution of the demand. In this way the overlapping peaks of individual demand would be to some extent avoided and the diversity-factor improved. This would be especially noticeable in electric transportation. At the present time in most cities there is great congestion in the late afternoon, owing to the fact that so many persons stop work and go home at nearly the same hour. In the operation of a telephone exchange there would be a similar, although a less marked improvement. In the case of electric lighting and power there would be a similar improvement, although it is difficult to determine in advance its extent.

For some years past there has been an agitation for making better use of daylight hours by a change in the standard of time. This usually takes the form of a proposal to set the clocks forward one hour. From the standpoint of the electric utilities, and probably also from the standpoint of the entire community, it would be more rational and also more convenient to make no change in the standard of time, but to encourage such individuals, companies and other working units for whom it may be feasible, to make a change in their working hours. This would not only have the advantages mentioned above, but it would also relieve congestion in lunch rooms and many other places of business.

While there are some lines of business whose time of operation may be fixed by law or regulations, such as banking, post offices, etc., these are few in number, and in some cases the hours are already short, so that a change in time would affect them but little. In other lines of business, such as merchandising in retail stores, the hours are not now uniform, and it is best that they should not be so. Some retail stores close at 5:30 p. m., some at 6 p. m., while others remain open even later, suiting their hours to the convenience of their patrons. In the case of factories and large offices, there is usually no need for uniformity with other concerns, and the diversity of hours would not only avoid some of the difficulties in congestion and peak loads, but would provide better opportunities for shopping by employees and better distribution of the business for merchants.

In the summer time, all except night workers have daylight throughout the working period anyhow, so that the movement which has been revitalized by the action of certain European governments represents little or no gain in this direction, and for the reasons above stated it would be better to have only a portion of the community, rather than all, advance their daily schedule by the prescribed hour.

SUMMER DIFFERENTIAL RATE SUSTAINED IN MASSACHUSETTS.

In a decision noted last week in our news columns in the case of Petitioners vs. Vineyard Lighting Company in re Rates, the Massachusetts Gas and Electric Light Commission presented some highly interesting comments upon the justification of a differential between summer and winter charges for service. Attention may be called to the willingness of the Commission to allow the company to retain in its residence lighting prices the outstanding feature of a 60 per cent reduction from October to May inclusive from the demand rates in force in the summer season.

The Vineyard Company supplies service on an island off the southern coast of the state, in which the far greater portion of the load which sets the limits of station and system capacity is that incurred by summer residents. The company is well managed, and in the past two years an exhaustive study of its revenue, rates and expenses has led to the virtual elimination of the meter system of charging for lighting customers. The cost of meters and of their reading has been eliminated by the adoption of a demand rate of $1 per month for a 25-watt unit, $1.80 for two, $2.40 for three and $0.60 per month for each additional unit, with a minimum season charge of $9.00 before connection is made. At the hearings the petitioners argued that a meter rate is the only fair one, and the company vigorously defended the demand system of charging. As the abstract of the decision shows, the board recognized that "the company's investment has been made virtually entirely to provide for the brief summer business when the largest demand is made for the shortest possible use of electricity for the year. Moreover, the maximum demands of all the customers are coincident." If the plant were operated for the summer season only, the decision states, the company could not dispense with any of the investment which it now has.

Here, in a nutshell, is one of the clearest expressions we have seen of the fundamentals of a rate situation—a complete appreciation of the truth that the price of a service must in a large measure be based upon its cost. The company had analyzed its busi-

ness sufficiently to determine the estimated relative cost of its summer and winter service, but the decision does not attempt to discuss these costs quantitatively, the board apparently being satisfied that the preponderating influence of the summer load is in this case so overwhelming as to leave little or no doubt as to the equity under present conditions of permitting the differential between summer and winter rates to stand, except in the cases of the large commercial users of electric lights represented by the hotels, churches, stores and bowling alleys. For such customers the choice of a meter rate is recommended, but the allowed retention of the demand system of charging, with the heavy discount included for the all-year resident, represents a most gratifying illustration of the Commission's appreciation of the relations between price and overhead charges which exist in the case of this exceptionally situated company.

THE NEW RUSSIAN LOAN.

The announcement this week that a loan of $50,000,000 to the Government of Russia has been negotiated in this country should be of considerable interest to electrical manufacturers. The terms of this loan are considered to be somewhat unique. A syndicate of New York bankers will furnish the money, which will be kept in the United States to be used as a Russian credit balance. The reciprocal part of the arrangement is the agreement of the Russian Government to establish credit in Petrograd at the disposal of the American syndicate at a favorable rate of exchange and if this is not otherwise utilized it may be used to purchase Russian Government bonds at a discount at any time within three years.

The negotiation of this loan will help to establish desirable commercial relations between this country and Russia and to improve the banking facilities already existing. The importance of these features to the electrical manufacturers of this country lies in the possibilities of developing large trade in electrical machinery and supplies in Russia, especially after the close of the war. How great these possibilities are is pointed out in an article upon other pages of this issue. This article shows that Russia's needs in electrical lines are great, that in the past they have been largely supplied by Germany, and that at no time and at no place outside of this country has there been so great an opportunity for Americans to extend their trade and especially in this particular branch. While American manufacturers may find little encouragement in seeking such trade at the present moment, it behooves them to lay their plans and make their arrangements now for the prosecution of such trade after the close of the European war, when many of the activities which derive their present impulse from that source will experience a slackening. The firms who make their preparations now and who persistently and adequately follow them up are those who may expect to reap the profits in the future.

BILLING BUSINESS AND RESIDENCE SERVICE TOGETHER.

Many electric light and power companies have made a practice of combining the consumption of a residence customer with the consumption of the same individual's business premises in one bill, and giving that individual the benefit of a single rate for the total consumption. In the case of wholesale or block rates, this often means a substantial reduction under the amount which would be billed for the two premises as separate consumers. There is little justification for this practice. It is usually adopted for the purpose of currying favor with the customer in question. The cost of service to two detached premises is the same under common ownership as where there is separate ownership, and meters must be supplied and read in duplicate, so that conditions are not of the kind that justifies any discount or wholesale rates.

Where public utility commissions have made rulings as to such conditions, they have been almost uniformly against regarding two premises of the kind indicated as a single customer, since otherwise discrimination would be exercised against other consumers whose conditions of service are the same.

When, on the contrary, business and residential service are supplied to the same building or to adjacent buildings so that the supply may be made over a common service connection, and through a single meter, the case is different and the same reasoning cannot be applied. A case of this kind was recently decided by the Missouri Public Service Commission, and it was ordered that a single meter should be furnished to supply both premises. In the case of this company, the Consumers' Electric Light & Power Company, it happened that the same rates were in effect for both business and residence service, so that the only point involved was the question of a minimum charge for one or for two separate services. Nevertheless, the point involved is of interest and may have application in cases of greater financial significance.

AMPLE LEAD WIRES.

The advent of the modern high-efficiency incandescent lamp made the capacity of a given size of lead wire in furnishing illumination much larger than ever before. The result has been a tendency to use No. 14 wire for all branch circuits in residence wiring, unless the actual connected load exceeded its carrying capacity, which cannot ordinarily occur under the rules. It is frequently overlooked that in the future heating devices are likely to be attached to lamp sockets and circuits may be loaded, or need to be loaded, to a point which, if not actually overheating the wire, may nevertheless cause an undesirable drop of voltage in the leads. This tends to make operation of both lamps and heating devices unsatisfactory. In drawing up wiring plans, ample provision should always be made for possible future requirements. It is a good principle to use plenty of copper.

Happenings in the Industry

Exports for March—Program of Annual Convention of American Institute—Illuminating Engineering Society Elects Officers—Engineers Study New York Street Lighting—Ontario Contractors and Dealers Hold Successful Convention—Concentric Wiring to Be Investigated by Committee—Electrical Supply Jobbers Discuss Reorganization at Spring Meeting

Electrical Exports for March.

From the monthly summary of the foreign commerce of the United States, just issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C., it is evident that the electrical exports from this country last March aggregated only a little less in value than the record shipments of February. For the four classes for which the numbers of articles exported are reported, there were shipped in March the following: Electric fans, 1,706; arc lamps, 221; carbon-filament lamps, 75,317; metal-filament lamps, 523,540.

The following table gives the detailed figures for last March and for the corresponding month of a year ago:

Articles	March, 1916	March, 1915
Batteries	$ 157,497	$ 166,041
Dynamos or generators	72,022	236,305
Fans	18,376	20,533
Insulated wire and cable	269,606	236,849
Interior wiring supplies, etc. (including fixtures)	69,981	65,159
Lamps—		
Arc	3,191	2,409
Carbon-filament	9,548	8,133
Metal-filament	86,894	42,963
Meters and other measuring instruments	63,824	41,305
Motors	473,771	166,648
Telegraph instruments (including wireless apparatus)	19,703	7,335
Telephones	130,534	53,066
Transformers	87,520	27,562
All other	1,372,408	587,363
Total	$2,884,875	$1,661,671

For the nine months ended March 31, 1916, the total value of electrical exports was $21,466,055; for the corresponding period in 1914-1915 the total was $13,867,092; for the similar period in 1913-1914 the total was $19,828,136.

Program of Annual Convention of Electrical Engineers.

The thirty-third annual convention of the American Institute of Electrical Engineers will be held at the Hollenden Hotel, Cleveland, O., June 27 to 30. There will be five technical sessions and numerous entertainment features, which will make the convention both profitable and enjoyable to all who attend.

The opening session will be held on Tuesday, June 27, at 10 a. m. There will be an address of welcome by Mayor Harry L. Davis and the President's Address, by John J. Carty. Two papers will be presented: "Electric Drive for Reversing Rolling Mills," by Wilfred Sykes and David Hall; "Motor Equipment for the Recovery of Petroleum," by W. G. Taylor.

At the Transmission Session in the afternoon there will be a Report of Transmission Committee, by Percy H. Thomas; "Effect of Barometric Pressure on Temperature Rise of Self-Cooled Stationary Apparatus," by V. M. Montsinger; and "Restoring Service After a Necessary Interruption," by F. E. Ricketts. In the evening there will be a dinner-dance and reception.

At the Protective Apparatus Session on Wednesday morning, the following papers will be presented: "Studies in Lightning Protection on 4,000-Volt Circuits," by D. W. Roper; "Experience in Recent Developments of Central-Station Protective Features," by N. L. Pollard and J. T. Lawson; "Protection of High-Tension Distribution Systems by Isolating Transformers," by O. O. Rider; "Megger and Other Tests on Suspension Insulators," by F. L. Hunt; "Experiences in Testing Porcelain Insulators," by E. E. F. Creighton; "New Method of Grading Suspension Insulators," by R. H. Marvin.

In the afternoon there will be an automobile trip and in the evening the Sections Committee conference, open to all members, as well as a theater party for ladies.

At the Electrophysics Session on Thursday morning the following papers will be presented: "Effect of High Continuous Voltage on Air, Oil and Solid Insulation," by F. W. Peek, Jr.; "The Corona Voltmeter," by J. B. Whitehead and M. W. Pullen; "Theory of Parallel Grounded Wires and Production of High Frequency in Transmission Lines," by E. E. F. Creighton. In the afternoon there will be games and other entertainment at Nela Park. After dinner at Nela Park, special cars will be taken to Shaker Heights Country Club, where there will be a presentation of past-president's badge, followed by dancing.

On Friday, June 30, there will be an all-day boat trip on *City of Erie*. A technical session will be held, with the following papers: "Suggestions for Electrical Research in Engineering Colleges," by V. Karapetoff; "Tractive Resistances to a Motor Delivery Wagon on Different Roads and at Different Speeds," by A. E. Kennelly and O. R. Schurig; "Application of a Polar Form of Complex Quantities to the Calculation of Alternating-Current Phenomena," by N. S. Diamant.

Election of Officers of the Illuminating Engineering Society.

The annual election of officers of the Illuminating Engineering Society resulted by means of a letter ballot as follows: General officers of the Society: President, W. J. Serrill, Philadelphia, Pa.; vice-president from Philadelphia Section, George S. Crampton; vice-president from New England Section, T. H. Piser; vice-president from Chicago Section, M. G. Lloyd; general secretary, C. E. Clewell, Philadelphia; treasurer, L. B. Marks, New York City; directors, C. A. Luther, Chicago; D. McFarlan Moore, Harrison, N. J.; P. G. Nutting, Rochester, N. Y.

The term of office for these general officers begins next October.

Section officers were elected as follows: New York Section: Chairman, W. Greeley Hoyt; secretary, Norman D. Macdonald; managers, William J. Clark, Alexander Maxwell, W. H. Rolinson, John B. Taylor and Edward Wray.

New England Section: Chairman, S. C. Rogers; secretary, R. G. Hudson; managers, J. W. Cowles, David Crownfield, C. A. B. Halvorson, Gifford Le Clear and George P. Smith.

Philadelphia Section: Chairman, Robert B. Ely; secretary, T. Elmer Moon; managers, P. H. Bartlett, John R. Hare, George A. Hoadley, T. J. Litle and Walter R. Moulton.

Chicago Section: Chairman, Otis L. Johnson; secretary, James J. Kirk; managers, A. L. Arenberg, A. O. Dicker, H. M. Frantz, E. H. Freeman and F. A. Rogers.

Pittsburgh Section: Chairman, S. G. Hibben; secretary, L. O. Grondahl; managers, Allan Bright, R. B. Chillas, T. W. Rolph, R. H. Skinner and M. C. Turpin.

The section officers will be installed at the first meeting of the 1916-1917 season.

Results of State's Operation of Generating Station in Massachusetts.

The Metropolitan Water and Sewerage Board of Massachusetts operates a hydroelectric generating station at the Wachusett Dam of the reservoir which supplies water to Greater Boston. During 1915 the station was operated 241 days, the output varying from its minimum amount which the Connecticut River Transmission Company is required to take under its contract with the Board, up to the full capacity of the plant. About 90 per cent of the total water discharged into the aqueduct was used to develop electricity. The following were the results of the year's operation:

	Kilowatt-hours.
Energy sold to Connecticut River Transmission Company	4,825,541
Energy used at power station	12,261
Energy used at sewerage pumping station	113,008
Total	4,950,810
Water used	23,151,700,000 gallons
Average effective head	89.6 feet
Energy developed per million foot-gallons	2.3866 kilowatt-hours
Efficiency of station	75.95 per cent
Earnings:	
Energy supplied Connecticut River Transmission Company at 0.53 cents per kilowatt-hour	$25,575.37
Labor supplied Connecticut River Transmission Company	13.00
Energy used at power and pumping stations, at 0.53 cents	663.92
Total, earnings	$26,252.29
Operating Costs:	
Labor	$ 4,804.13
Fuel for heating building	75.00
Repairs and appliances	446.34
Taxes, to local community	2,800.00
Total operating cost	$ 8,125.47
Net earnings	$18,126.82
Net earnings per kilowatt-hour developed	0.3661 cent

Illuminating Engineers Study New York Street Lighting.

Rain and drizzle did not keep down the attendance at the final session of the season of the New York Section of the Illuminating Engineering Society, held on the evening of June 8, at the auditorium of the United Electric Light & Power Company, 187th Street and Broadway, New York City. Through the courtesy of the company an informal dinner was served to the 150 members and guests prior to the business session.

Chairman D. M. Moore introduced W. T. Dempsey, in charge of street lighting construction and maintenance for the New York Edison Company, who talked on "Electric Street Lighting in New York." After outlining briefly the development of public lighting from the early gas lamps of 1823 down to the present, he said that both electric arc lamps and mantle gas lamps have practically disappeared from the Borough of Manhattan, having been displaced by type C units gas-filled tungsten lamps. Slides were shown giving the day and night appearance of the units. Motion pictures, showing the complete installation of posts as well as the maintenance of the system, gave a much clearer conception of these operations than would have been possible by ordinary means.

The discussion was rather brief because the schedule did not leave sufficient time. Among those who spoke were D. F. Atkins, chief engineer of light and power, City of New York; C. A. Halvorsen, General Electric Company, Lynn, Mass; William A. Durgin, Chicago, Ill.; W. T. Crampton, Philadelphia, Pa.; A. G. Sawin, Newark, N. J., and P. S. Millar, New York City.

Immediately following the lecture all present entered 40 waiting automobiles and were driven over a route of about 15 miles, where practically every type of lighting referred to in the paper could be seen in use. It is unfortunate that rain marred what was otherwise a valuable as well as an interesting meeting. W. F. Little, chairman of the Papers Committee, is to be congratulated, as the attendance at the season's gatherings made a new record.

Ontario Electrical Dealers and Contractors Hold Successful Convention.

The Electrical Dealers' and Contractors' Association of Ontario, held its second annual convention June 6 to 8, at Massey Hall, Toronto, Canada, with a good attendance from all parts of the province. In addition to the convention a good electrical show was a big drawing card which brought visitors from neighboring provinces as well. The exhibition hall was tastily decorated and exhibitors from the United States and Canada displayed their latest electrical conveniences. The show was open to the public in the evening. The attendance was stimulated by giving away many household appliances to ladies who attended the show.

The convention opened on Tuesday afternoon with an address of welcome by G. D. Earle, president, who also reviewed some of the more important activities of the Association. An address on inspection was then given by H. F. Strickland, chief electrical inspector of the Province of Ontario. He made a strong plea for higher standards of electrical construction and pointed out the relation of inspection to the securing of this end.

On Wednesday morning the session opened with an address on advertising, presented by J. C. Kirkwood, who likened advertising to sunshine in farming. Sunshine is needed to start the growth of field products, but the farmer must apply himself steadily to the farm in order to get results. So, likewise, must advertising in the electrical field be accompanied by personal and active work. A paper on "How to Keep the Electrical Business in the Family," was presented by Gordon C. Keith, of Toronto, who gave some original methods illustrating how the electrical contractor might make a successful merchant of himself and reap the profits from the business made possible by the rapid and continuous developments in electricity.

A general discussion on the subject of resale followed, in which R. Grant, of Peterboro, submitted a written discussion stating that the dealers and contractors must meet the jobbers and manufacturers on a common ground to discuss freely a system of standard prices in the same way as is customary and very successful in the grocery business. He suggested that the Association initiate this movement. C. A. McLean spoke as a jobber and said he felt that standard prices properly maintained will give the desired feeling of confidence to the electrical business. This is especially necessary as regards household appliances. In regard to contractors' materials a somewhat different condition may be called for, probably the best being a standard percentage above cost. Edward G. Weed, speaking from the standpoint of the manufacturer, pointed out that prices must be kept as low as possible in order to encourage sales. He thought it was high time that price-cutting of well advertised goods be stopped. He pointed out also how standardization of prices would make for satisfied customers.

At the afternoon session on Wednesday a general discussion on the subject of co-operation was indulged in, addresses being made by Walter Carr, F. M. Dusenbury, A. H. W. Joyner, R. T. Jeffrey and A. C. Lyons. Mr. Dusenbury said that contractors are the legitimate retail dealers in electrical goods. If the contractors are to handle this business to the extent that they should, they must actively go after it. Central stations and contractors are co-operating in a great many cases and such co-operation should exist in every town. Mr. Joyner referred to the relationship of contractors with each other, with their customers and with the manufacturers. He urged that the only satisfactory way to enter into a co-operative plan is to do it unselfishly for the success of the entire industry. Mr. Jeffrey spoke as a representative of the central stations, showing that the more business the central station has

the more business there is for the contractors. He referred to the extremes existing in some cities of contractors charging exorbitant prices for their work and in other cases turning out work so cheaply and so poorly that reputable contractors would not have a fair chance. Between these extremes there is a happy medium where the contractor can install work properly and get a fair return for his service. Mr. Lyons, president of the Brantford Electrical Club, described the co-operative work undertaken by this organization. Contractors, dealers, jobbers and manufacturers gathered together under its auspices to straighten out all misunderstandings and differences. By a close examination of their various costs, which were carefully audited by an impartial central-station authority, fixed prices for standard wiring were arranged and advertised. A great stimulus to the contracting business resulted and a large number of houses were wired because it was possible to know definitely what the cost would be. C. D. Henderson, secretary of the Brantford Club, outlined the cost system which is now being used by the contractors of Brantford, and which has resulted in successful business.

At the Thursday session reports of committees were presented. W. H. Lodge, on behalf of the Committee on Organization, introduced a resolution as a result of which there was appointed a committee to further consider organization and future action of the Association regarding fixing of fees and other matters. On this committee were appointed W. H. Lodge, chairman; A. C. Lyons, J. N. Miller, W. J. McLinden and E. A. Drury. In accordance with the committee's suggestion, it was decided to leave the Retail Merchants' Association and to form county clubs permitting all electrical men to join and to have a central organization, the officers of which must be electrical dealers or contractors.

Another report presented was that relating to licensing of contractors, which reviewed the work of the committee which has carefully canvassed this matter and which drew up a law that was to be submitted to the Ontario Legislature. On consultation with the Ontario Hydro-Electric Power Commission it was decided, however, to join with that body in securing the enactment of a law which aims to raise the standard of electrical work and to promote co-operation between the Commission and the various electrical interests of the province.

Election of officers for the ensuing year then followed with the following result: President, G. D. Earle, Toronto; first vice-president, J. N. Miller, Peterboro; second vice-president, W. J. McLinden, Owen Sound; secretary E. A. Drury, Toronto; treasurer, M. S. Soules, Oshawa. Chairmen of committees were selected as follows: Licensing Committee, W. H. Lodge, Toronto; Electrical Development Committee, E. Etherington, Stratford; Resale Committee, George T. Dale, Toronto; Inspection Committee, W. R. Fellows, Jr., Blenheim; Organization Committee, A. C. Lyons, Brantford.

At the final session E. F. Griffith, of Toronto, presented a paper on bookkeeping and cost accounting for the contractor and dealer. The necessity for accurate accounting was emphasized and a suitable system of accounts was described. A paper on interior illumination was presented by T. M. DeBlois. The principles of interior lighting were discussed and a plea made that abstract physical efficiency be regarded with less importance than effectiveness of illumination. Proper consideration must be given to the requirements of the eye, such as avoiding glare and providing neither too low nor too high an illumination intensity. A practical talk on developments in incandescent lamps was made by H. D. Burnett, of the Canadian General Electric Company.

Tuesday evening was devoted to formal opening and inspection of the electrical show. On Wednesday evening was given a moonlight excursion on Lake Ontario.

Concentric and Other Bare Grounded-Return Wiring Systems to Be Investigated.

Shortly after the organization of the Associated Manufacturers of Electrical Supplies there was appointed by it a committee of business and technical experts on concentric wiring, which later became known as the Committee on Electric Wiring Systems in the Electrical Industry. The latter has now appointed the following Subcommittee on Bare Grounded-Return Wiring Systems:

Chairman, C. E. Corrigan, Associated Manufacturers of Electrical Supplies, Pittsburgh, Pa.; W. H. Flandreau, International Association of Municipal Electricians, Mt. Vernon, N. Y.; J. C. Forsyth, American Institute of Electrical Engineers, New York, N. Y.; G. S. Lawler, Associated Factory Mutual Fire Insurance Companies, Boston, Mass.; C. Renshaw, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; secretary, William S. Boyd, Western Association of Electrical Inspectors, 175 West Jackson Boulevard, Chicago, Ill.

This committee desires the co-operation of the entire electrical industry in this work, and to that end requests that all information and data on wiring systems having a bare grounded conductor be sent to the secretary. The committee will especially appreciate the following information:

(1) Safety, cost and reliability data based upon practical experience with concentric wiring, or any other type of wiring having one or more bare or partially covered conductors which are permanently connected to earth.

(2) Theoretical or tested installation details or protective features which will safeguard concentric wiring or other wiring systems having bare grounded conductors.

(3) Reliable methods of preventing meter setters or linemen from reversing the polarities of a two-wire system.

(4) A suitable definition of "ground" or "earth" as these words relate to electric wiring.

(5) Practical experience with ground or earth connections: (a) whether they have been found reliable, or unreliable; (b) the proportion found to be unreliable, if any.

(6) Adequate methods of establishing and maintaining a reliable ground or earth connection for safety purposes.

(7) A simple method of test which will insure the detection of unreliable ground or earth connections.

(8) Economies which may be practiced with safety in connection with any of the existing wiring methods.

(9) Estimates or actual figures as to the cost of any protective features reported upon in response to the foregoing requests.

(10) Any data or experience calculated to assist the committee in reaching an accurate conclusion relative to the practicability of bare grounded-return wiring systems.

Massachusetts Lighting Commission Reports for 1915.

The thirty-first annual report of the Massachusetts Gas and Electric Light Commission, which covers the operations of companies and municipal plants for 1915 and includes tables from the annual returns for the year ending June 30, 1915, is about to be issued. The volume consists of 820 pages, which is about 80 more than the last report. Returns are made by 52 electric companies, and for the first time by three hydroelectric companies. There are 22 combination gas and electric companies in the state. There are 36 municipal plants.

The Commission's inspectors investigated smoke abatement and assisted operators to adopt the best methods of complying with the smoke-nuisance law. The decrease in smoke emission is due to the hearty co-operation of owners, engineers and firemen. The number of stationary

stacks emitting excessive smoke decreased from 786 to 643.

Total assets of electric companies, other than hydro-electric companies, increased $5,000,000 from 1914, the 1915 figures being $77,588,478. One of the companies showed that it had not earned expenses, as against five companies in 1914, while 11 declared no dividend, as compared with 14 in 1914. Gross profits increased $287,797; 43 companies paid dividends, which averaged 11.57 per cent, compared with 10.22 in 1914.

The following electric companies reduced their maximum net price: Ayer, 17 to 15 cents; Cambridge, 10 to 9; Brockton Edison, 12 to 11; Lenox, 16 to 15; Malden, 11 to 10; Marlboro, 15 to 12; Milford, 18 to 14; New Bedford, 11.4 to 10.45; North Adams, 12.5 to 11; Suburban (Revere), 11 to 10; Williamstown, 13 to 12; Worcester Suburban, 15 to 14.

There were 19 fatal electric accidents, as compared with 23 the year before. Only three were company employees.

The report includes new legislation pertaining to lighting companies, and laws advocated by the Commission, several of which have been enacted by the present legislature.

Electrical Supply Jobbers Discuss Reorganizing of Divisions.

A very interesting meeting of the National Electrical Supply Jobbers' Association was held at Hot Springs, Va., June 6, 7 and 8. There was a particularly active series of sessions, the general association meeting morning and afternoon, and there being held at the same time several meetings of the Central Division and the Atlantic Division. Golf was rather taboo because of the importance of the discussions and the difficulty of finding the grounds and the weather in such condition as to allow of a favorable opportunity for playing a good game.

The most important matter coming before the Association at this time was the presentation of and discussion upon the report of the Survey Committee. It will be remembered that at the Detroit meeting in February of this year General Secretary Overbagh presented a number of illuminating suggestions looking to the reorganization of the activities of the Association. In line with these suggestions the Survey Committee recommended that the members of the Association be divided into eight groups which would hold frequent meetings in various parts of the country, leaving but two general sessions, one in the spring and one late in the fall, for the general association. It was considered desirable to group the activities of the various members of the Association as nearly as possible in conformity with the territory into which the most active effort went for the establishment of distribution of electrical supplies upon the part of the various member companies. The report of the Survey Committee will be published and presented fully to the members and definite action will be taken at the general meeting which will be held early in October in Cleveland, O.

Another matter which aroused considerable interest and which afforded conjecture with regard to its great possibilities, was the authorization by the general meeting for the secretary to engage the services of a permanent auditor of operating expense. This expert will investigate the cost of handling various supplies so as to establish definite ratios of expense for the economic distribution of electrical material and equipment.

The various sessions were well attended and devoted in the main to the presentation of committee reports and the discussion of the intimate problems respecting the relation of the distributor to the manufacturer, and the trade and ultimate consumer of electrical material. The matter of manufacturers' price lists was the subject of considerable discussion, and there was evident a tendency toward the suggestion that the distributor would be in a better position with regard to his trade if the manufacturer would refrain from publishing price lists other than the lists of prices which obtained with regard to his immediate distributor. Another subject which attracted considerable discussion was with regard to the growing tendency of manufacturers to quote a single discount rather than a complicated chain of discounts. Undoubtedly this idea will be developed and it was hoped that all manufacturers of standard electrical equipment would shortly make it a business practice to quote a single discount in connection with all matters of distribution and resale.

A. K. Baylor, of the heating appliance department of the General Electric Company, made a very interesting and comprehensive address dealing with the electric-heating situation. He described in detail the litigation between the Hoskins Manufacturing Company and the General Electric Company and told in a vivid and virile way of the broad-minded and high-principled action of the General Electric Company in emerging from this litigation to the decided advantage of the other manufacturers of electric-heating devices, and in conserving the interests of the central-station companies of the country. He explained fully the license agreement which was being made between the owners of the heating-wire patent and the manufacturers of heating devices, and elicited a round of applause when he demonstrated the businesslike methods which had been pursued in establishing a definite and highly satisfactory position for the jobber as an efficient medium for the distribution of this material.

Other addresses were made by Mr. Patterson, of the auditing department of the General Electric Company, who outlined the imperative necessity of business men engaged in all forms of industry to reconcile their accounting methods with the plans which were being formulated and distributed to industry by the Federal Trade Commission, and Frank E. Watts, Past Jupiter of the Jovian Order, who made an eloquent and pleasing appeal for the support of the jobber in the co-operative work now being carried on by the Jovian Order.

Glassware for the Lighting Industry.

Since the outbreak of the war the stoppage of continental supplies of glassware of various kinds has led to the reorganization of this business in England and some very important research work on the subject has been carried out. A special instance is furnished by the work of the Research Committee of the Institute of Chemistry, which has succeeded in establishing the formulas of a number of important varieties of glass used in special optical and laboratory work, supplies of which are now being manufactured in the British Isles.

At the last meeting of the Illuminating Engineering Society of Great Britain, held recently in London, there was an important discussion on glassware in relation to natural and artificial lighting. The question of standardizing the various kinds of glassware used in the forms of bulbs for electric lamps, chimneys, globes, reflectors, etc., was keenly discussed and something was also said on the making of prismatic window glass for securing the maximum admission of daylight into buildings obstructed by neighboring premises.

S. B. Langlands, who read an introductory paper, made a number of interesting suggestions, one of them being that an attempt should be made to standardize the sizes and materials of glassware widely used for lighting purposes, the object being to establish once and for all the best conditions and then, by concentrating on standard types, to bring about economies in manufacture. Special reference was also made to varieties of glass needed for special purposes. For example, it has hitherto been found difficult to obtain neutral-tinted glass plates of specified absorbing power for photometric work. Again, while colored glass has been prepared for the purpose of obtaining "artificial daylight" from electric incandescent lamps, there

are different varieties on the market which do not give identical results. While it is difficult by this means to secure an exact resemblence to daylight, it is at least desirable that some standard conditions should be specified so that the artificial daylight should always have the same properties.

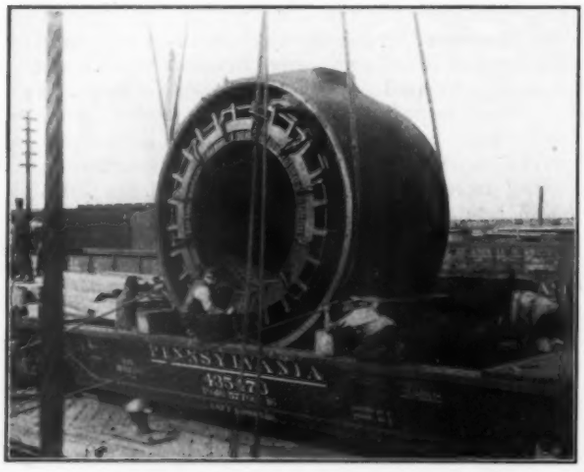
Discussion also turned on the preparation of opal glass for lighting fixtures. Here again there is variation. Some kinds of glass diffuse the light uniformly without enabling the filament to be seen. Others cause the filament to shine through, appearing a dull red, and cause a noticeable modification in the color of the light transmitted. The amount of light absorbed may therefore vary within wide limits, and it would be a help to decide on some standard form of glass which could be easily made and would have the best illuminating qualities.

Among other special types of glass we have the kind now being experimented with, which has the property of absorbing ultra-violet rays and transmitting unchecked the visible spectrum. It is suggested that glass of this kind would be of great utility for cases in museums, containing objects of priceless value. It is well known that the colors of such objects fade in course of time, and that this fading is apparently accentuated by exposure to daylight. The effect of daylight in this respect is ascribed mainly to the action of the ultra-violet constituent. Probably, therefore, by using panes of glass that obstruct these rays the fading of colors could be prevented to a great extent.

It was suggested that the whole question of glassware used in the lighting industry should receive the attention of a special committee to be formed of members of the Illuminating Engineering Society, working in conjunction with other bodies interested.

Transporting an 80-Ton Stator Nearly 2,000 Miles.

The development of the zinc-mining industry in the Joplin (Mo.) district since the European war began has been so intensified that demands for electrical energy for mining operations have become insistently increasing. The Empire District Electric Company, of Joplin, a subsidiary of the Cities Service Company, whose distribution system covers the entire Joplin district, recently was required to meet demands for energy seldom required of a central station. Generating equipment was absolutely necessary. A survey of the market revealed no possibility of obtaining a new unit, but a second-hand 10,000-kilowatt turbo-generator was purchased from the Brooklyn Edison Company. When first installed the machine was shipped from the factory in parts and assembled on the foundation. To save weeks of delay, it was decided to ship the unit in as few parts as possible and avoid complete dis-assembly. The largest part, the stator, weighs 160,000 pounds, is 14 feet high, 13 feet long and 8 feet wide.



Loading the Stator on a Special Flat Car.

The problem was to find a car to safely transport this enormous mass of iron and copper. Cars were available that could carry either the bulk or weight involved, but none could fulfill requirements except one furnished by the Pennsylvania Lines. Due to the extreme height of the load it was necessary to map out a special routing to avoid bridge and tunnel clearances.

The shipment arrived in Joplin during the early part of May, having made a record run from St. Louis in 48 hours. The cause of this haste, according to the railroad officials, was that the yards were so congested there was no room for "baby elephants."

Tribute to the Memory of E. M. Barton.

A large portion of the June issue of the *Western Electric News* is devoted to the sketch of the career of the late E. M. Barton, one of the founders of the Western Electric Company and chairman of its Board of Directors at the time of his death. The text is illustrated with photographs showing Mr. Barton in his office and with numerous historical photographs showing employees of the Western Electric Company in 1878 and in 1881, etc. Tributes to the memory of Mr. Barton are contributed by H. B. Thayer, president of the company; H. A. Halligan, vice-president; W. P. Sidley, vice-president and general counsel; Gerard Swope, vice-president and general sales manager; A. L. Salt, vice-president and general purchasing agent; Charles E. Scribner, chief engineer, and F. R. Welles, a former vice-president. Others outside of the Western Electric Company who pay tribute to his memory are: Theodore N. Vail, president of the American Telephone & Telegraphy Company; U. N. Bethell, vice-president of the American Telephone & Telegraph Company; B. E. Sunny, president of the Chicago Telephone Company, and Thomas D. Lockwood, general patent attorney, American Telephone & Telegraph Company.

An interesting feature of the issue is a contribution by Mr. Barton written shortly before his death entitled "How I Hired Mr. Thayer."

National Advertisers Declare for Honest Advertising.

The Association of National Advertisers, representing the leading general advertisers of America, has taken a forward stand with regard to honest advertising in line with the inspirational movement now being conducted by the Associated Advertising Clubs of the World.

At the annual meeting of the Association of National Advertisers, held at Dayton, Ohio, on May 5, the following Declaration of Principles was unanimously adopted:

RESOLVED that we, members of the ASSOCIATION OF NATIONAL ADVERTISERS, are opposed to advertising of the following kinds:

All advertising that is fraudulent or questionable, whether financial, medical or any other; all advertising that is indecent, vulgar or suggestive either in theme or treatment; that is "blind" or ambiguous in wording and calculated to mislead; that makes false, unwarranted or exaggerated claims; that makes uncalled-for reflections on competitors or competitive goods; that makes misleading free offers; all advertising to laymen of products containing habit-forming or dangerous drugs; all advertising that makes remedial, relief or curative claims, either directly or by inference, that are not justified by the facts or common experience; and any other advertising that may cause money loss to the reader or injury in health or morals or loss of confidence in reputable advertising and honorable business.

RESOLVED that we recognize our own obligation as advertisers to conform to these principles.

RESOLVED that we urge upon all publishers and upon all sellers of advertising space or service, a strict adherence to these principles and that in so far as the exigencies of our individual business will permit, we direct our advertising to those mediums which make the observance of these principles their rule and practice.

Miscellaneous NEWS NOTES

Patriotism Is Topic at Los Angeles Jovian Meeting.—Patriotism and preparedness were the keynotes of a luncheon given by the Jovian Electric League of Los Angeles, Cal., June 7. Judge P. J. McCormick gave an address on "Sparks at Random on the Subject of Patriotism."

Protest Electric Charters.—Protests have been made to the governor of Pennsylvania against the approval of the charters of the Lawrence Hydroelectric Company and the Conoquessing-Lawrence Light & Power Company, whose incorporation papers were approved by the Public Service Commission recently. After a series of hearings protest was made by the Pennsylvania Power Company.

New Officers for Chicago Section, A. I. E. E.—The nominating committee of the Chicago Section, A. I. E. E., has presented the following nominees for the year 1916 and 1917: Chairman, Taliaferro Milton; secretary, W. J. Crumpton; member executive committee, W. J. Norton. Election will be by letter ballot and the result will be announced at the annual convention of the A. I. E. E. at Cleveland, O., June 27-30.

Tri-State Association to Convene.—The sixth annual convention of the Tri-State Water and Light Association of the Carolinas and Georgia will be held at the Isle of Palms, June 21-23. The program includes a large number of speakers who will cover important matters relating to city light and water departments. J. G. Barnwell, city manager of Rockhill, S. C., will speak on "The City Manager and His Responsibilities." W. F. Stieglitz, of Columbia, S. C., is secretary and treasurer of the Association.

Kansas City Jovians Rejuvenate.—The Jovian League of Kansas City, Mo., held its third rejuvenation under the present administration on the steamer *Chester*. The initiation was held in the ballroom of the boat and was finished while the boat was in motion. Three hundred took the trip, including women and children, the latter drawing prizes given by the B-R Electric Company, Western Electric Company, Kansas City Light & Power Company, Funsten Electric Company, Westinghouse Electric & Manufacturing Company and General Electric Company. Fifteen candidates were initiated.

Merger of Rhode Island Central Stations Is Effected.—The Narragansett Electric Lighting Company, Providence, R. I., has bought a controlling interest in the Westerly (R. I.) Light & Power Company, which supplies light and power in a territory of about 200 square miles and serves a population of 30,000. The Narragansett company now controls all the electric lighting business in southern Rhode Island and in southeastern Connecticut. The Westerly company's gross income has increased from $106,931 in 1911 to more than $150,000 in 1915, and it paid, the latter year, 5 per cent on both common and preferred stock. The former majority owners of the property were Bodell & Company, who have controlled it since 1912. It is understood that the price paid was $95 per share.

Kentucky Passes Workmen's Compensation Law.—In common with other employers of five or more persons, the electrical companies of Kentucky, beginning with August 1, will operate under the terms of the workmen's compensation law enacted by the last session of the Legislature. The constitutionality of the law has been upheld in a decision just handed down by the Kentucky Court of Appeals, which passed on all except one section which relates to the matter of indemnities payable to non-resident aliens related to the persons assured. Later decisions in this instance will not affect the validity of the law as a whole. Rates and indemnities are prescribed, but no state fund is created and companies may insure with commercial or mutual concerns or carry their own insurance.

Northern Cedar Poles in Detroit.—The Detroit Edison Company reports that during the year 1915 over 5,000 Northern cedar poles were used by the company. This includes only the poles used in the Detroit district and not those used in the various other territories served by the company.

Holyoke to Have One-Cent Power Rate.—The municipal light department of the city of Holyoke, Mass., has reduced its power rate to large consumers to 1 cent per kilowatt-hour for 500 or more horsepower used over a 24-hour period, effective July 1. Other new rates, which eliminate inequalities, have been established. The percentage discount has been abolished, prices quoted now being net.

Massachusetts Companies Show Large Business Gains.—Among the Massachusetts electric-lighting companies which show a large gain in business during the past 10 months are the Leominster Electric Light & Power Company, which has made a net gain in horsepower connected of 338 per cent; the Spencer Gas Company, 306 per cent; the Clinton Gas Light Company, 254 per cent; and the Milford Electric Light & Power Company, 208 per cent.

Baltimore Section, N. E. L. A., Elects Officers.—At the annual meeting of the Baltimore Consolidated Section of the National Electric Light Association, held May 31, W. H. Cassell was elected chairman; Thomson King, vice-chairman; D. C. Bruce, secretary, and W. A. Zimmerman, treasurer. The meeting was addressed by H. A. Wagner, president of the National Electric Light Association and president of the Baltimore Consolidated Gas, Electric Light & Power Company, by C. M. Cohn, vice-president of the company, and others.

New Orleans Company Issues Monthly.—*Energy* is the name of a new monthly publication which has entered the field of central-station house organs. It is published by the employees of the New Orleans (La.) Railway & Light Company and undoubtedly will do much towards enhancing the spirit of co-operation and good fellowship which already exists among the employees. The May issue contains a rather complete account of the very successful electric show which was held in New Orleans April 24 to 28. W. E. Clements, commercial manager of the company, had much to do with the success of the affair.

Portland Employees March in Preparedness Parade.—About 600 employees of the Portland (Ore.) Railway, Light & Power Company, among them President Franklin Griffiths and other officials of the company, marched in the preparedness parade held in Portland recently. This number would have been greater had not more than 75 per cent of the employees been forced to remain on duty during the parade. The employees of the Portland company have been encouraged to identify themselves with military organizations, and this corporation was the first in Portland to openly endorse the preparedness movement.

New Jersey Company Gives Safety-First Lectures.—An interesting safety-first lecture and demonstration was given by A. J. Van Brunt, director of safety education of the Public Service Corporation, in Jersey City, N. J., May 31. The meeting was attended by the employees in the gas and electric commercial and operating departments. Mr. Van Brunt was assisted by J. Anderson, chief inspector of the Public Service Company, who demonstrated on first aids for persons receiving an electric shock or being overcome by gas. The Public Service Corporation maintains a safety educational department, and illustrated lectures are given twice each year. The lectures are always new and fitted as far as can be to the class of employees to which they are delivered. The Public Service Corporation has 800 feet of moving-picture film and some 500 lantern slides for use in its safety-first movement.

Electricity in the Manufacture of Pianos

Description of the Processes Involved and Advantages of Central-Station Service in This Industry—Data Are Given on a Typical Installation Purchasing Power

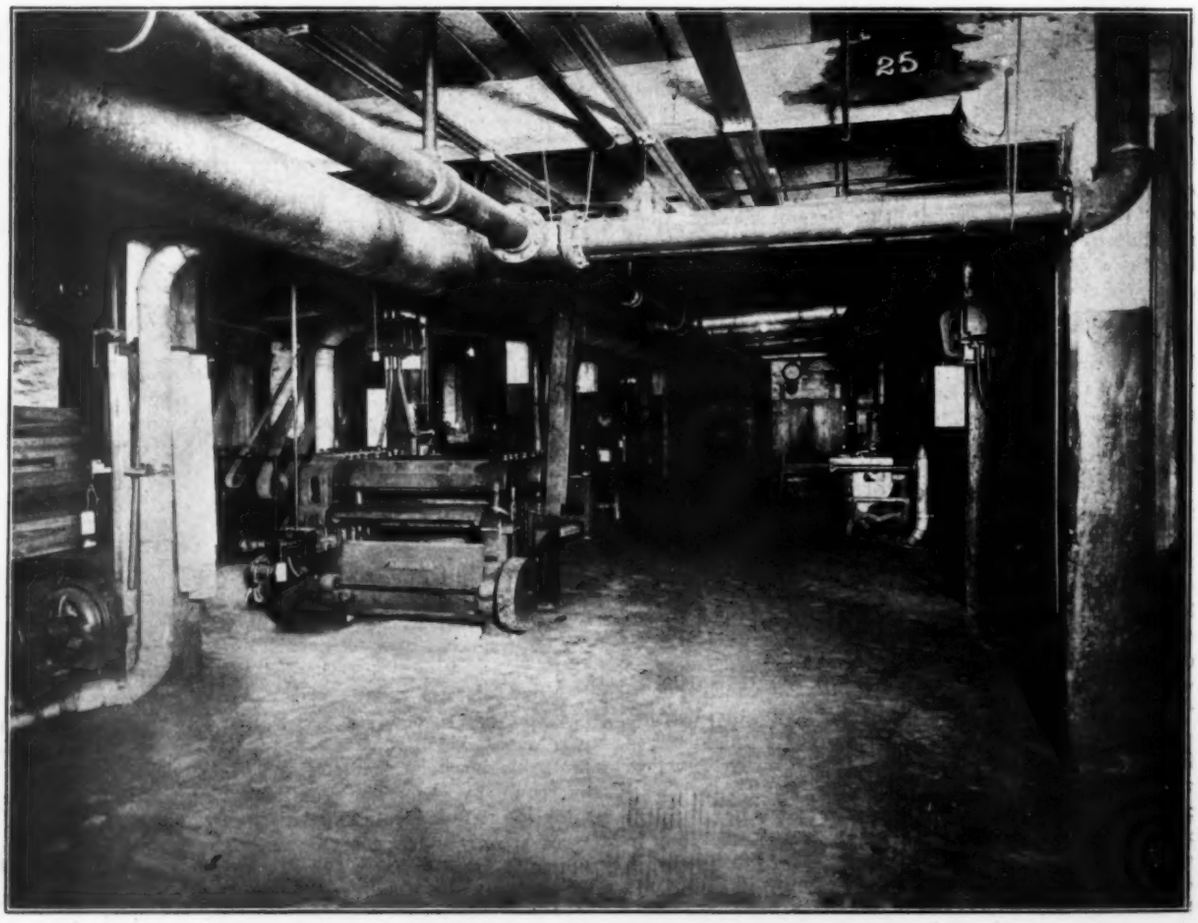
Industrial Power Series—Article No. 167.

PIANO manufacture, with the possible exception of some of the largest companies, is generally confined to making the cases, backs, a small amount of metal work, and assembling. In the general equipment of machinery, therefore, woodworking tools predominate. By nature of the class of work carried on, the use of any particular machine is more or less intermittent and for this reason individual drive is especially applicable, or if group drive is used the number of machines composing each group should be small. As woodworking machines are operated at practically constant speeds, squirrel-cage induction motors are particularly adapted to the work.

As a typical illustration of a piano-manufacturing plant, completely equipped with electric drive and using central-station service, a description of the Wegman Company's factory at Auburn, N. Y., is given in the following paragraphs. This company makes high-grade pianos, both upright and grand, and has a capacity of twelve instruments daily. The plant consists of a large three-story and basement building located along the lines of the New York Central Railroad, fully equipped with the latest machinery, driven both individually and in small groups. All motors are three-phase, 220-volt, 60-cycle, squirrel-cage machines. Service is furnished by the Empire Gas & Electric Company from its 2,200-volt, 60-cycle distribution system. It may be mentioned that the former Wegman plant was completely destroyed by fire a few years ago and the present buildings were formerly occupied by a company manufacturing traction engines. The entire machine equipment as well as the mechanical power equipment of the old company was removed, and although large quantities of steam for kilns and heating are required, necessitating a boiler plant, central-station service was decided upon as the most economical and satisfactory. All motor feeders are run in conduits and each motor is provided with a fuse box in addition to the starting compensator. Motors of five horsepower and under are started from switches.

Advantages of Central-Station Service.

It may be well to consider some of the advantages of electric drive and central-station service for this class of industries. Owing to the intermittent use of the machine, where electric drive with purchased power is used, power costs cease entirely as soon as a machine is stopped in the case of individual drive and where group drive is used only sufficient energy to overcome the friction of small line shafts is used. Certain machines can be grouped so that the average power demands of the group will be ap-



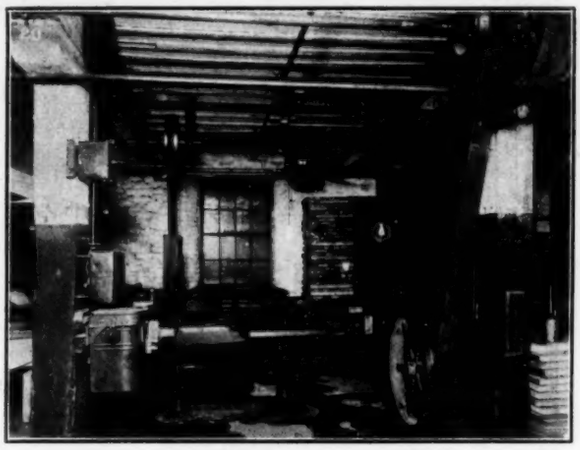
Motor-Driven Planers in Piano Factory.

proximately uniform, and for small machines this drive will be found satisfactory, as the motor will carry a load approximately normal. Planers and large circular saws and some other woodworking machines have heavy and intermittent power demands, therefore the whipping of shafting and the slipping of long belts owing to this condition is eliminated by motor drive, uniform speed is obtained and each machine can be crowded to its maximum capacity thereby increasing production. The ease of control when electric drive is used insures that the machine will be shut down as soon as its work is done and there will be no continued friction loss from jack shafts, counter shafts and other devices necessary with mechanical transmission of power.

Although modern plants are provided with systems for removing wood refuse from the machines, there is considerable dust that will collect in the building, and where line shafts and heavy belts are used this is kept in circulation to a greater or less degree. Electric drive reduces upkeep expenses and materially adds to the life of a building as the strains and vibration from heavy shafts and large belts are decidedly deteriorating in their constant use. There can be a more economical disposition of floor area with electric drive and the machines can be placed in the most logical position for facilitating movement of the raw and finished material. Various departments can be worked overtime to pick up work that is dragging and the power consumption is confined to such departments as the power requirements of machines in other departments cease when shut down. Continuity of service is practically assured as the interruption of service of one machine or a small group does not interfere with the remaining machines.

Special Applications.

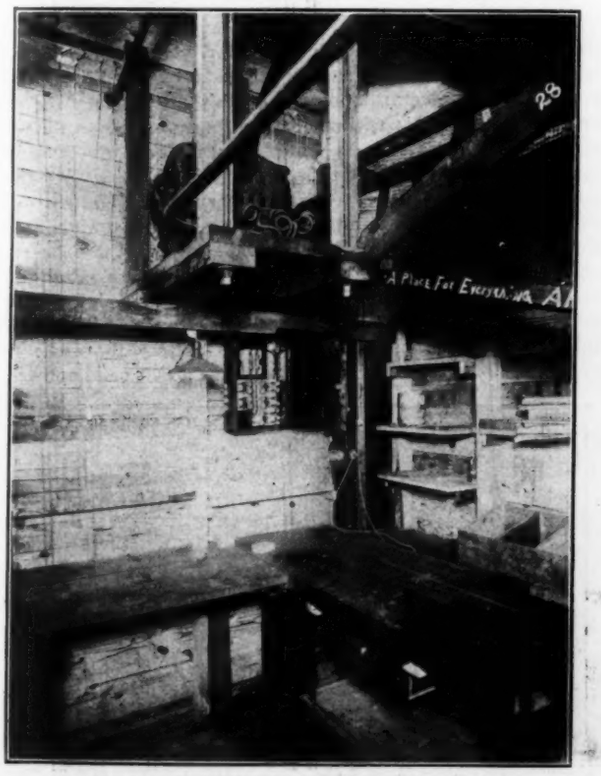
In the Wegman plant there are a number of special machines which result in great economies. One in particular is a special planer for piano backs which planes the two



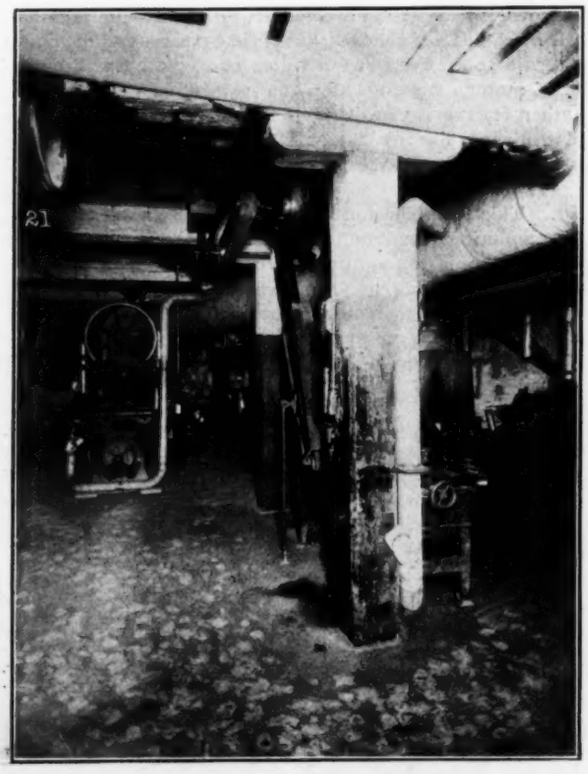
Motor-Driven Tenoning Machine.

upright edges simultaneously with a far greater degree of accuracy than can be insured with hand work. This machine has a capacity of 200 backs daily and requires three men to operate it. It requires the services of 25 men to perform the same work by hand. This planer is individually driven through a short jack shaft direct-connected to the motor shaft. The motor is rated at 10 horsepower and operates at 1,800 revolutions per minute.

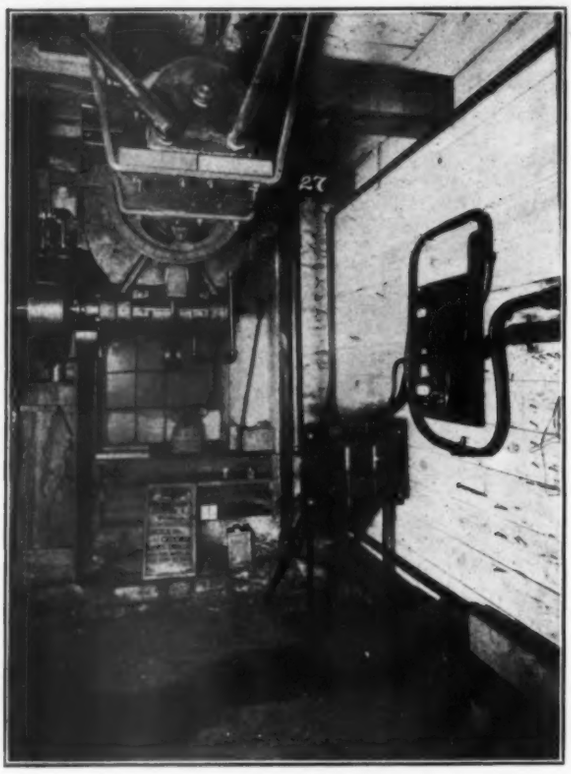
Another machine that is a great labor saver is for polishing woodwork. Highly finished wood as used in all piano cases requires much rubbing, and the polishing machine has been introduced to eliminate part of the hand work. The work is clamped on a suitable table and mechanically operated pads rub the surface. This machine is driven by a five-horsepower motor, running at 1,800 revolutions per minute. Even the coarser dressing of the wood is machine work, done by various types of sand-



Bracket Suspension of Motor Driving Woodworking Machinery in Piano Factory.



Band Saw With Direct-Connected Motor—Motor-Driven Planer in Foreground.



Motor Driving Elevator Mechanism.

paper machines. One type consists of an adjustable table with a sand-paper belt running over suitable pulleys. The belt runs above and beneath the table and the upper side is pressed against the wood to be smoothed by a block in the hands of an operator. This machine together with a wood-boring machine is driven by a 7.5-horsepower 1,606-revolutions-per-minute motor through a line shaft.

All machines are relieved of refuse by a system of piping connected to an exhaust fan which is driven by a 12-horsepower motor, running at 1,200 revolutions per minute. Another feature is the drive of two circular saws with the tables placed side by side. The motor is placed on the floor at the rear of the machines and is direct-connected to a short jack shaft which is in turn belted to the two saws. This combination is driven by a 7.5-horsepower, 1,606-revolutions-per-minute motor. For cutting up heavy lumber there is an automatic-feed rip saw and a cross-cut saw on a swinging arm. These machines are driven by a 20-horsepower motor operating at 1,200 revolutions per minute. There are many other motor applications, both individual and group, which are enumerated below:

No.	Horse-power.	Speed R.P.M.	Kind of Drive.	Application.
1	10	1800	Belt	Special planer for piano backs.
1	7.5	1606	Group	Sand-paper machine, boring machine.
1	5	1800	Group	Band saw, boring machine.
1	10	1800	Group	Three sand-paper machines.
1	15	1200	Belt	Sturtevant exhaust fan for removal of wood refuse.
1	5	1200	Direct	Band saw.
1	5	1800	Belt	Scroll saw.
1	10	1800	Belt	Surface planer.
1	25	1200	Belt	Automatic feed sand-paper machine.
1	5	1800	Gears	Planer.
1	7.5	1606	Group	Two circular saws.
1	5	1800	Belt	Surface planer.
1	7.5	1606	Belt	Joiner.
1	2	1200	Belt	Boring machine.
1	5	1800	Belt	Rip saw.
1	25	1200	Belt	Planer.
1	25	1200	Group	Wood lathe, special wood lathe, planer.
1	20	1200	Group	Automatic-feed rip saw, cross-cut saw.
1	5	1800	Belt	Boring machine.
1	5	1800	Group	Three emery wheels, drill press.
1	5	1800	Group	Glue machine, radial drill.
1	15	1200	Group	Joiner, circular saw, pump.
1	5	1800	Group	Band saw, saw sharpener.
1	2	1800	Belt	Drill.
1	5	1800	Belt	Fan for heating system.
1	5	1800	Belt	Wood-polishing machine.

Composite Balance Sheets of Massachusetts Companies.

Electric lighting companies in Massachusetts gained in the aggregate almost a million dollars in gross income in the year ended June 30, 1915, as compared with the year before. Income from commercial lighting increased about $620,000, from power $200,000, and from rent of motors and fixtures almost $100,000. The latter has come to be a considerable source of revenue to Massachusetts central stations, amounting in the case of motor rentals to about $60,000, and for rental of fixtures $93,000. The renting of motor equipment to factories and shops was taken up by electric companies in the central part of the state about two years ago.

The general change in central-station practice from selling electric lighting by contract to the metering of energy used for that purpose is reflected in the returns, which show that in 1914 contract sales yielded $4,781,000, while in 1915 the income from that source was only $159,000. On the other hand, meter sales rose from about $4,700,000 to $9,942,000. Income from public lighting was about the same as in the preceding year, but electricity sold to other companies yielded about $30,000 less.

On the other side of the balance sheet, the largest items of expense increase were in the wages of station employees and of those caring for lights. These two items showed an increase of about $85,000, or 7.5 per cent. Repairs and renewals of lines and conduits jumped from $806,000 to $896,000, but repairs and renewals of meters and transformers showed a decrease, from $240,000 to $131,000. General salaries advanced from $824,000 to nearly $891,000, but salaries of officers increased only $9,000 in all.

Interest charges decreased $50,000 and dividends increased more than $500,000. Expenditure for coal was practically the same in the two years—almost an even $2,000,000.

Flood Lighting an Entire City.

The officials of Seal Beach, Cal., have devised the novel idea of partially illuminating their city from the outer edge of the long pier, which extends outward into the ocean from the central portion of this attractive place of amusement. This is without doubt the most unique illuminating installation of its kind ever undertaken by any municipality in the western part of this country. At the end of this long pier there is a battery of electric searchlights, which are so arranged that at night they illuminate the entire water front of the city. They may also be revolved so that their light may be thrown for miles up and down the beach. The light from these searchlights may be seen for a great distance along the coast, as well as for miles inland and out to sea. In this battery there are 41 searchlights, each being of more than 25,000 candlepower.

Installation of Flood-Lighting Units for Lighting Town in California.

Dedication of New Massachusetts Institute Buildings

THE dedication of the new buildings of the Massachusetts Institute of Technology, at Cambridge, Mass., which occurred June 12 to 14, was an event of importance in the scientific and technical world. From the time of its founding, in 1861, M. I. T. has been notable for the superior quality of its instruction and for the large number of able and well-trained men who have graduated from the institution. From small beginnings it has grown to almost 2,000 students, of whom 345 during the past year were engaged in studies pertaining to electricity.

No educational group in the country is perhaps comparable with the new technology plant, on the Charles River basin. The very extent of the structure along the water side is impressive. A great central court opens on the river, rising in broad terraces of steps. Beyond this is the colonnaded portico of the library, surmounted by a Roman dome of substantial and imposing aspect, about 200 feet high.

The buildings nearest the river are of three stories, with pilasters running to the top of the second story. The structures behind are of four stories. All are of classic design.

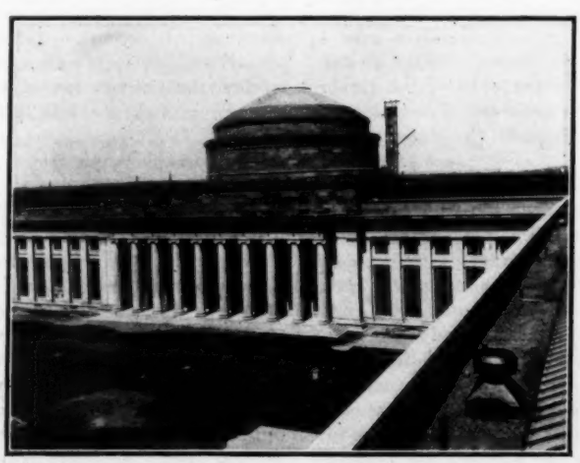
The front court, and other courts immediately back of the front row of buildings, are flanked by department buildings, which are linked together so as to afford circulation from one end to the other of the vast group. The buildings are comparatively narrow and receive light from both sides.

Half of the area of land, about 2,250,000 square feet in all, is devoted to the educational plant; the other half will be given to an undergraduate clubhouse, gymnasium, dormitories and commons—social features the Institute has lacked hitherto.

Dedication Events.

There were practically five distinct programs, for invited delegates and guests, alumni, 1916 seniors, undergraduates, and women, the latter alumnae and families of delegates and alumni. The great spectacular feature was a masque and pageant in the great court, Tuesday evening. From a flotilla arriving at the embankment debarked the faculty and guests, bearing the archives of the Institute. In the center of the court was a great ring illuminated with spotlights, while electric searchlights flooded the whole arena, producing extraordinary effects. The drama produced dipicted the rise of man from chaos to conquest of all nature. The finale represented the old Technology greeting its successor and was a fitting climax.

Other features of the celebration, which also marked the semi-centennial of the first graduating class, were: A formal farewell to the old buildings; fraternity luncheon; the laying of the corner stone of Walker Memorial; marine, aquatic aerial and submarine events at the Basin; inspection of the new plant; graduation of the class of 1916; a banquet at which the pan-continental telephone was demonstrated and parades, teas, luncheons and reunions.



New Library Building.

Lighting Arrangements.

Eighty-two projectors and two high-powered navy searchlights were used in the illumination of the Masque and Pageant on June 13. On either of the roofs of the buildings flanking the Great Court in which the drama was given were 34 1,000-watt stereopticon lights spaced at three feet three-inch intervals and located 55 feet above the courtyard level. All were equipped with color screens except four lamps on either side, 12 being blue, 9 green and 9 red. The screens were all pure colors, of the Pevear type, and enabled any color ranging from white to be obtainable in combination. Six 500-watt projectors were located in the third floor windows of the building at the head of the court, and the two searchlights were on the roof, trained on ships in the Basin.

Under the floor of the central ring, which served as a stage, were four 1,000-watt units, each located in a pit with glass cover at floor level, and there were also four 250-watt units, similarly located, to illuminate streams of water projected over them, to produce effects in water dances.

All the illumination was controlled by telephone from an operating booth at the back of the east grandstand. At each station a man received and passed on the pageant director's orders to the men in charge of the dimmers.

The projectors were of Crouse-Hinds, Sun-Ray and Kleigh manufacture, and the searchlights, which were of the Carlisle-Finsch type and of about 60 amperes capacity, were borrowed from the United States Navy. J. H. Anderton, of the Stone & Webster Engineering Corporation, had general charge of the installation and operation of the lighting.

President R. C. Maclaurin, of the Massachusetts Institute of Technology, has the distinction of having financed the construction of the new plant. He secured gifts of about $9,000,000, and at the same time carried forward the regular work of the institution without interruption.

Commercial Preparedness for War Aftermath

By A. A. Gray and M. G. Lloyd

The possibilities of electrical trade in Russia by American manufacturers and exporters are extensive, as Russia supplies but a small part of her own wants and previous electrical imports have been largely from Germany. Preparations should be made now for prosecuting this business promptly after the cessation of hostilities, when the pressure of orders and difficulties of foreign shipments will have been relieved.

THE United States is at present experiencing one of the most active periods of its industry and commerce in its history. A considerable volume of the present business is directly traceable to the European war and the termination of this war will undoubtedly introduce another period of radical readjustment. Wise executives will not wait until that time arrives to make their plans for prosecuting business under the new conditions. Preparations for the future should be made in the present, and commercial preparedness is quite as essential to the well-being and prosperity of a business corporation as is preparedness for defensive purposes to the well-being of the nation. Business preparedness involves looking ahead to determine where business operations will be carried on, and then perfecting the machinery to carry out these operations without delay or confusion when the time arrives.

In this country hundreds of thousands of men who, only a year or slightly more ago, were working for a stipend of from $2 to $3.50 per day, are now literally rolling in wealth from their point of view. Ordinary wages for thousands of men have increased in many cases 200 to 300 per cent. These workmen are by all accounts living up to the limit of their income, indulging in many luxuries heretofore unattainable. The problem of the future is not so much a question of maintaining the wage scale at its present basis as it is of fending off conditions that will bring about a wage scale lower than labor has received in many years in this country.

If conditions such as these are allowed to come about it will mean a more unhappy revolution in the relation of capital and labor than this country has ever been subjected to before.

How is the possibility of such an industrial cataclysm to be avoided? No one has appeared upon the political horizon nor has a student of economics made an appearance, in possession of an acceptable and logical answer. The solution of the problem is difficult, indeed, because even though we stretch prescience to the limit, we have no guide marks of past experience paralleling present conditions to lead us to a reasonable postulate from which to project our expectations of an answer.

The danger is not in the impossibility of arriving at a solution; the grave concern is in lulling ourselves into a sense of security and remaining indifferent to the necessity for an immediate study of the portents of the future and a courageous impulse to overcome the difficulties no matter how momentous and insuperable the distant view appears.

It is of prime necessity that associations of manufacturers, publishers of daily newspapers, magazines and trade and technical publications particularly, give earnest study to the methods which must be incorporated into business and domestic activities in view of the best possible estimate of conditions the future will bring forth.

Manufacturers in the United States in many lines are at present enjoying a period of unprecedented activity and a corresponding profitable employment of their facilities. Prices of manufactured goods are high because those who are buying want things badly and there is no parsimony today in barter and exchange when the fate of a nation may hang upon its ability to secure equipment quickly.

For a considerable period after the end of the war this country will undoubtedly be called upon for a great amount of manufactured commodities which will go into the rehabilitation of the countries now at war.

So far as foreign business with European countries is concerned, it is to Russia, that great unconquered field of industrial opportunity, that the manufacturers of the United States must turn their business eyes. Of all the countries in Europe it is undoubtedly a fact that we are better regarded in Russia than in any other.

The object of this article is to point out the opportunities which exist for disposal of electrical merchandise in Russia. That country represents an extensive market for the disposal of electrical goods, both in the present and in the future. There is at the present time a very active demand in Russia for electrical machinery and equipment of all kinds. At the present, however, the majority of American manufacturers do not need to go to so far afield for orders and the obstacles to carrying on trade with Europe are serious. The unwarranted interference by England and Germany with the commerce of neutrals, not only with belligerent nations, but with each other, and their disregard of the rights of neutral commerce as established by treaties and international law, have made our commerce in that quarter of the globe hazardous and unsatisfactory. Ocean freight rates are abnormally high and the rate of foreign exchange also militates against exports. Communication with foreign correspondents is also carried on at a disadvantage, as mails are interfered with and there is no assurance of delivery of cablegrams. It might be mentioned here that it is advisable to send mail matter to European countries during the war by registered post, as the chance for delivery is thereby increased, and if not delivered, matter can be more easily traced.

Trade after the war, therefore, presents many more attractions than orders for immediate delivery, but the opportunities for the latter are also large and offer unusual profits to the manufacturer or exporter who is in a position to prosecute this business.

In addition to the preparations which may be undertaken at home, there will be a number of details which have to be attended to in the foreign market. Among these may be mentioned the securing of agents or representatives in the foreign countries, the arrangement of credits, the preparation of advertising, the investigation of the requirements of the market and the arrangement of shipping facilities. Reference to these in greater detail will be found below.

Russian Electrical Trade.

The consumption of electrical products in Russia has shown a remarkable increase during the last ten years. The total volume of electrical imports to that country in 1906 was $2,850,000. By 1913 this had increased to $13,000,000. Of the latter over $8,000,000 is credited to Germany. It would thus appear that the latter country has been supplying Russia with about twice as much of her electrical material and equipment as all other countries put together. This conclusion, however, is not entirely reliable, since products from Switzerland and France and other European countries which reach Russia by way of

Germany or by shipment from a German port are credited in the statistics to Germany. It is nevertheless true that that country has been the main source of supply for the Russian consumption of electrical machinery and materials.

Of 1,802 chief towns in Russia, there were in 1911 only 74 which were electrically lighted; by 1915 this number had risen to 225. The proportion is thus still at a low figure, although recent growth has been large and the prospect of even more rapid extension of such facilities after the completion of the war may be confidently anticipated. Certainly the demand for such conveniences among the common people will be enormously greater as a result of the war. Many young men have been taken away from their homes for the first time and through contact with other communities will have learned greater possibilities of ministering to their wants and their comfort than were ever realized before. They will have had their ambitions awakened and their desires quickened. The elimination of vodka from the daily ration has enormously increased the consuming capacity of the Russian for merchandise of all kinds and it has left him with a clearer head to increase his own earning power and to take an interest in those things which will make his life fuller and more in keeping with modern developments in other countries.

The effect of the war on millions of the peasantry can hardly be imagined. Hundreds of thousands of young men, through their excursions into foreign places with the Russian army are becoming familiar with accommodations they never knew of before. Better clothed, better fed as soldiers and as refugees, they are receiving an inspiration which is firing them with a desire for more and better things.

There will be a demand in Russia after the war for merchandise of all kinds in greater quantities than was ever known before, and electrical development will experience an impulse in its proper proportion.

Railway electrification has been seriously considered by the Russian Government and it will not be surprising at any time to see large developments in this field taking place in that country.

All of Russia's needs, however, are not to be met by foreign imports. The telephone system of the country is conducted by the Government and all equipment for this purpose is obtained from domestic manufacturers. Foreign trade in this particular line would consequently be limited to providing local systems. Factories for the manufacture of certain other electrical equipment already exist in Russia, but their capacity is far from being sufficient to meet the requirements of the local demand. The copper production of Russia has been steadily increasing and will probably soon be sufficient to supply domestic requirements. Whether factories will be established to supply the requirements for insulated wire and similar products remains to be seen. There will undoubtedly be a large field of opportunity for the investment of American capital in manufacturing plants of all kinds for supplying local needs; at the same time the equipment of such plants would make a market for considerable quantities of machinery. There is already a demand for machinery which is not being met along such lines as mining, textiles and steel manufacture. The depletion of stock during the war and the actual destruction in the war zone have made requirements for replenishment which will undoubtedly be large.

To the manufacturer in the United States, loaded to the guards with orders, going into near delirium from the pounding of impatient customers in one direction and simulating madness in his reproaches to the fiends in the form of producers who are holding up his raw material and to the railroads, short of cars and making impossible the deliveries of what he has available, the prospect of foreign trade does not seem so interesting. The market is so far away; what do we know about Russia anyhow? What do the people in Russia know about the things we make? Their principal consumption is in fur-topped, tremendous boots, toe-length overcoats, leather belts, steeple hats, dog whips and chains to lead excursions into Siberia!

Who Will Get the Trade?

As pointed out above, Russian trade in the past, especially in the line of electrical manufacture, has been largely with Germany. This has been due partly to geographical contiguity, to German banking facilities in Russia, to German commercial enterprise, a favorable commercial treaty, and familiarity with the requirements of the market. To successfully take the place of German traders, Americans must be willing to put forth the same effort. Of course, after the war, German influence will be at a minimum and the feeling against that country will make it hard for German firms to re-establish their trade. Russian orders will by preference go in another direction. Strong efforts will be made by English manufacturers to secure this trade. In spite of the fact that they are allies with Russia in the present war, the feeling toward them in that country is not entirely favorable. For years England was one of the traditional enemies of Russia and that feeling has not been entirely dissipated. On the other hand, the United States is the traditional friend of Russia and our relations with that country have always been upon an amicable basis. Other things being equal then, American products are likely to be in favor. In order to secure and maintain the trade, however, American manufacturers cannot sit in their offices and wait for orders to come to them, but must make an effort to get in touch with the market. They must be properly represented abroad, they must supply articles that meet the needs of buyers, and must be prepared to do business on terms which are satisfactory to the purchasers.

The fears expressed in many quarters that European manufacturers will be in a position to undersell their American competitors are likely to prove unfounded. Prices paid for goods of such origin in former times have not been conspicuous for their low values. After the war, manufacturing in the belligerent countries will be carried on at a disadvantage. The high rate of mortality during the war will have depleted the ranks of workmen, and the experience following previous wars has shown that this contraction in the supply of labor results in a higher wage and consequently increased manufacturing costs. The demand for reconstruction work in the belligerent countries will be large, and will absorb a large amount of the available labor. Taxes will necessarily be high in order to carry the burden of the enormous war debts which are now being contracted, and there is no reason to believe, in the light of history, that the present governments of the European countries will have sufficient acumen to place these taxes anywhere else than upon industry and business. The American manufacturer will consequently be subjected to less severe competition than in normal times.

Perhaps this conclusion might be altered should the wide employment of women in factories, which has taken place during the war, continue after its conclusion. A change of this nature is more likely to take place in England than in Germany, but it is not likely that such a suicidal policy will be carried out even in the former country. Industrial conditions during the past generation have been so bad in England as to seriously lower the standard of average health and physical development among English men. Subjecting women to similar conditions would result in an even more serious deterioration of the race, and it is not likely that such a condition would be looked upon with favor, even for the purpose

of maintaining British commercial supremacy. Moreover, British commercial policy in the past has not included catering to the idiosyncracies of the local demands in foreign countries. The English have usually been content to offer their product to the foreign purchaser and let him take it as it is or leave it. In some markets this has been a serious handicap, and German traders have been quick to take advantage of it, but in Russia this attitude will not be of so much importance because the trade in electrical lines will be largely satisfied with foreign stock designs. This condition will also make it easier for the American manufacturer to supply satisfactory material.

Credit for periods of four to six months has been a common basis for doing business in Russia and although, at the present time, cash upon delivery or against manifest of shipments is more often available, firms going actively after Russian business should be prepared to arrange terms of credit. This does not necessarily mean that the manufacturer or exporter must carry this burden, but credit facilities should preferably be arranged through the banks. The establishment by the International Banking Corporation, which is now controlled by the National City Bank of New York, of a branch at Petrograd, will help to solve this problem for American trade.

The securing of proper representatives in Russia is a serious matter. The practice of establishing exclusive sole agencies is one of very questionable desirability. In many cases this practice has proved a detriment to the manufacturer. The efforts of such agencies in many cases are confined to peddling of the agency as a whole at a profit, or to dividing the territory up among a number of subagents. Local representatives in direct touch with the manufacturer or exporter are usually preferable. Great care should be exercised in securing these representatives and in extending credit to them. Credit extensions to large factories or established corporations are usually safe, whereas individual traders are more frequently open to suspicion.

A number of commercial associations are in existence which should facilitate the establishment of foreign connections. One of these is the Russian-American Chamber of Commerce, with headquarters at Moscow. Other societies have recently been founded for the economic development and extension of foreign trade of Russia. The Russian Trade and Industrial Union and the Moscow Merchants' Society are prepared to supply information and negotiate sales. The former contemplates establishing trade and industrial museums throughout the country with exhibits of samples.

Advertising in Russia has not reached the state of development with which we are familiar in this country. The methods employed are more simple and in fact even crude. Modern methods might prove quite effective if carried on in a way that would not be offensive to native taste. Advertising campaigns started at once would probably result in beneficial returns later on. Trade periodicals are few in Russia and the field could be covered without great efforts. A favorable rate of exchange at the present time would reduce the cost quite appreciably below the normal rates. Catalogs in the Russian language would, of course, be of great assistance, but are not absolutely essential, as most large business houses can carry on negotiations in English. Ordinary English units of measurements are generally satisfactory in engineering lines, although not in use by the common people, among whom the metric system is well established.

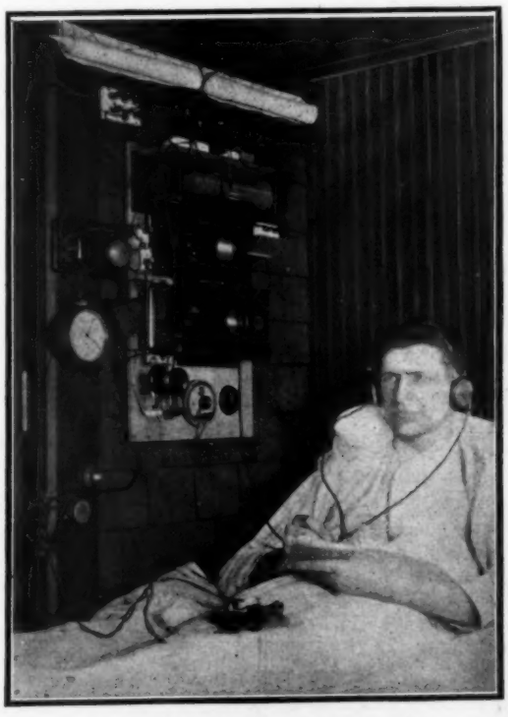
There is a vast opportunity for the investment of American capital in Russia at the present time, as vast natural resources are awaiting development. Connections established in this manner would, of course, open great opportunities for American trade in furnishing equipment for factories, machinery for power houses, etc. Foreign capital is welcomed for such purposes, and the enterprise of the Germans in this respect was an important element in their domination of trade. The war has resulted in the withdrawal of a considerable part of this capital and other sources must be looked to in the future. The American opportunity is consequently opened in every direction. American capital may find profitable investment, American products will meet a waiting market and American men will find many opportunities for the application of their ability, brains and experience.

Pittsburgh Patient and Student Keeps in Touch with World by Wireless.

By means of wireless telegraphy a patient in the Tuberculosis League Hospital, Pittsburgh, Pa., is able to cultivate acquaintances over all the country. Although confined to a couch on a sleeping porch for several months he did not feel that he was isolated from his fellowmen and time passed quickly and pleasantly.

Paul F. Shuey, a university graduate, was engaged at work on a fellowship at the Mellon Institute for Scientific Research when his health began to fail. He went to the hospital, but could not endure idleness. While in bed he continued his electrical studies and rigged up a wireless outfit. The apparatus was placed on the wall at his bedside and the aerial was spread from a mast on the roof of the hospital building. The outfit was installed primarily to get the correct time from the United States Observatory at Washington, but the keen enjoyment of talking to new-found friends and of picking up messages that floated through the air was not to be resisted and Mr. Shuey improved his outfit.

Radiograms from all parts of the country now cheer the patients at the hospital. The station at Sayville, L. I., which receives the German war bulletins, is heard constantly, and the baseball scores are received regularly during the season from the Arlington station. Mr. Shuey has become known to all the amateur wireless men within a radius of 100 miles of Pittsburgh.



Sending Wireless Messages From Bed.
[Photo from Pittsburgh Industrial Development Commission.]

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Electric Cooking Activity in Seattle.

The Puget Sound Traction, Light & Power Company, of Seattle, Wash., is actively engaged in promoting the use of electric cooking and reports very satisfactory returns. H. J. Gille, sales manager of the company, advises that range sales for the first four months of 1916 are about double those for the corresponding period last year, and sales are increasing from month to month.

The company employs eight men who devote their entire time to selling electric ranges, in co-operation with local dealers. These salesmen call only on selected prospects among the utility's light and power customers. Prices for the electric ranges include the cost of wiring, the latter being turned over to local electrical contractors. Liberal terms are offered to all who desire them.

The company maintains two range display rooms and a model kitchen in which advertised demonstrations are held twice a week. The company is also contributing to the support of an electric-cooking school and free public lectures on electric cooking. Electric-cooking demonstrations are also conducted at various fairs and public gatherings under the auspices of the Puget Sound company. The company employs a demonstrator who gives free instructions to every range purchaser.

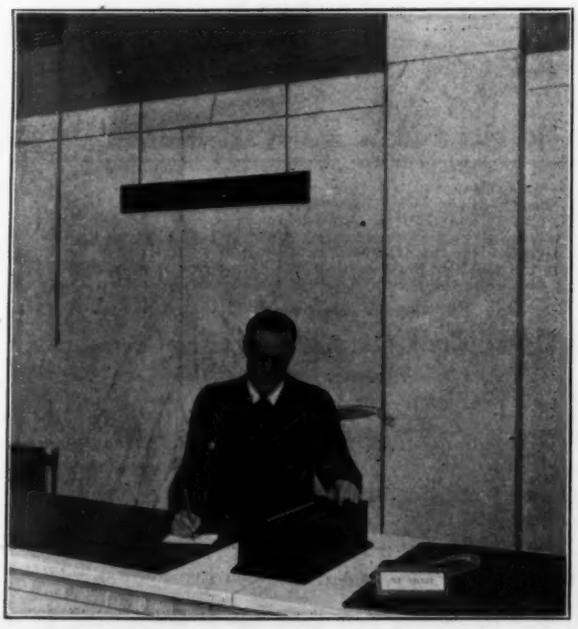
Aside from the personal solicitation of the salesmen, the greatest results have been obtained from newspaper advertising which is confined to two daily papers and several country weeklies. Personal letters are also sent to prospective range buyers and electric-range booklets are distributed from display rooms and periodically mailed to prospectives.

Improving Central-Station Clerical Service by a Visible-Signal System.

One of the annoying problems of a large central station appears to have been solved in a unique and very successful manner by the Cleveland Electric Illuminating Company, Cleveland, Ohio. We refer to the "waiting-for-duplicate-bills" problem—which may be taken to include not only duplicate bills, but deposit receipts, meter readings and any other information contained in the accounting department and wanted for the immediate use of a waiting customer.

Here is the way it used to happen: Scores of people every day, mostly during the noon hour, would come into the company's main office to pay their electric light bills, but without bringing their bills with them. This, of course, necessitated (and still necessitates) the making out of a duplicate bill. The customer would be told to wait until his bill was ready—generally from five to fifteen minutes. Upon arrival of the duplicate bill, sent down from the billing department via pneumatic tube, the desk clerk would lustily call out the customer's name, and the latter would then take the bill to the cashier and pay it. Often, however, hitches occurred in the service; the desk men, engrossed in some matter or other, would not call out a customer's name until he or she had waited so long as to become disgusted, and leave; there was no means of telling instantly how many customers were waiting at any one time.

Referring to the illustrations, here is the way it now works out: Mary Smith, consumer, who requires a duplicate bill, is told to take No. 6, let us say, and watch



Desk Set for Communicating with Bookkeepers in Billing Department.

Annunciator Board for Notifying Customers That Duplicate Bill is Ready.

the numbered signal board, bearing numbers from 1 to 16, until her number flashes up. The desk man throws over key No. 6 on his desk set, causing small, white signal lamp No. 6 to light, not only on his set but on the two duplicate sets used by other clerks in the same large room. At the same time a white signal lamp No. 6 lights upstairs in the billing department. When the billing clerk receives, through pneumatic tube, slip bearing No. 6 and the customer's name, he makes out duplicate bill, sends it down, and presses his own switch No. 6, causing 6 to light upon the large board downstairs, and also lighting a red lamp on each of the three duplicate clerks' sets. The customer sees 6 light on the large board, and claims her bill. The clerk delivers it, and throws his key No. 6 to neutral position, clearing the number from the board. The whole transaction is quiet, visible and as speedy as could be desired. The system was designed by engineers of the Illuminating Company, under the supervision of J. T. Kermode, manager of the company's service department.

Electric Water Heater in Boys' Dormitory Solves a Problem.

An interesting application of an electrical water heater is in a Dormitory of Mill Brook School, Concord, Mass. The students' rooms are located on the second floor of a recitation building and gymnasium, in which the heating facilities are required only a part of the time—in the cold season. To provide for a supply of hot water for the pupils' use in their rooms and in the bath rooms, a Simplex water heater was installed, with a 30-gallon tank in connection, in the basement of the building. The switch on the circuit connected with the heater is in the hallway, on the floor where the students' rooms are heated. In order to procure hot water in the morning, or at any other time, the teacher in charge turns on the current and in five to eight minutes sufficient hot water is available for all the 6 or 8 pupils to wash or to take baths.

The element of safety is a very valuable feature. Much of the time the building is entirely vacant and fire left burning would be a source of danger. The heater can be left connected without danger to the property or the equipment; but it can be shut off by the snapping of the switch, which is located in view beside the head of the stairway.

Louisville Company Offers Its Office To Churches for Bazaars and Fairs.

A thousand or more Louisville ministers, charity organization officials, heads of hospitals, benevolent clubs, etc., have received a circular letter from the Louisville Gas & Electric Company, which, whether or not it results in the recipients taking advantage of the offer, is certainly going to add to the good will the town holds for the company. The letter was an invitation to persons addressed to make use of the offices of the company on Chestnut Street, near Fourth Street, for bazaars, candy sales, etc., and read as follows:

At frequent intervals churches and religious societies have bazaars, candy sales and other affairs of this kind, and it is usually difficut to secure a suitable store room or hall in which to hold them. In addition there is always the annoyance of having installed a gas stove, suitable electrical appliances, having the gas and electric services connected, the cleaning and arranging of the place, etc.

Mr. Donald McDonald, General Manager of our Company, has instructed me to extend an invitation to all churches and religious and charitable organizations to conduct such affairs in our office at 311 West Chestnut Street, which is centrally located and excellently arranged for such purposes. We only require about one half of the floor space, and therefore the entire east portion of the room on the ground floor will be at your disposal.

Sufficient notice should be given to avoid conflict of dates and to allow us to suitably rearrange the place.

We will have installed a gas range or any gas or electric appliance desired and put one of our porters at your disposal without any charge whatever.

As many of our customers remit to us by mail, they seldom come to our office. Therefore we will be glad of the opportunity to become better acquainted with them. If you will extend this invitation to the organization you are associated with, I assure you it will be greatly appreciated.

This is, of course, the dull season for bazaars, cake or candy sales, etc., but the company is receiving acknowledgments in numbers from those who received the letter. The space available is greater, perhaps, than that provided in the average store room, and, though occupied by desks and occasional exhibitions, it can be readily cleared for such uses as considered in this connection.

Large Contract for Power in Minneapolis Flour Mills.

The Minneapolis division of the Northern States Power Company has signed a contract with the Washburn-Crosby Milling Company calling for the delivery of 4,600 horsepower of electrical energy to the Minneapolis flour mills. The contract is for a period of 15 years and largely increases the quantity of electrical power heretofore supplied the mills by the power company.

Boston Edison Company Furnishes New 50-Watt Mazda Lamps.

The Edison Electric Illuminating Company of Boston on June 1 began to furnish its lighting customers with the new 50-watt Mazda lamp which has recently been developed and gives about 50 candlepower. This lamp will

New Mazda Lamp

Commencing June 1, 1916, Mazda lamps will be furnished to the lighting customers of this Company as follows

EXCESS PRICES

Size	Old	New	Size	Old	New
15 Watts	$ .25	.20	150 Watts	Free	Free
25 Watts	18	.12	250 Watts	Free	Free
40 Watts	.16	.12	400 Watts	Free	Free
50 Watts	(New)	Free	500 Watts	Free	Free
60 Watts	Free	Free	750 Watts	Free	Free
100 Watts	Free	Free			

Note the New 50-watt Mazda Lamp

This lamp has just been developed by the manufacturers and is expected to give approximately **50 candle power**, and is to take the place of the 50-watt GEM lamp now in general use, which gives **20 candle power**. This GEM lamp will be almost immediately withdrawn from service. It is also expected that the 40-watt and the 60-watt lamps will be withdrawn by the manufacturers within the next year.

Note the reduction in prices of the 15, 25 and 40-watt lamps

The Edison Electric Illuminating Co. of Boston

Lamp Renewals will be made at the Places Named Below

Boston, Edison Building, 39 Boylston St.
Arlington, 647 Mass. Ave.
Brookline, 1334 Beacon St. (Coolidge's Corner).
Chelsea, 775 Broadway.
Framingham, Union Ave.
Hyde Park, 1531 Hyde Park Ave.
Lexington, 414 Mass. Ave.
Medway, Sanford Building, Village St.
Milton, 10 Adams St.
Natick, 8 North Ave.
Needham, 880 Great Plain Ave.
Newton, 280 Centre St. (Nonantum Square)
Reedindale, 782 South St.
Somerville, 351 Medford St (Winter Hill).
Somerville, 4 Holland St. W Somerville.
Walpole, 67 West Street.
Waltham, 82 Moody Street.
Wayland, State Road West.
Winchester, 537 Main Street.
Woburn, 395 Main Street.

Advertisement Announcing Lamp Prices.

replace the 50-watt Gem lamp now in general use, and the Gem will be withdrawn from service. The 50-watt Mazda will be made the standard for new installations.

MUNICIPAL OWNERSHIP.

By T. R. Hay.

The modern central station has come to be a public utility in the broadest sense of the word, in many cases, doing an interstate business and, therefore, subject not only to direction and control by the State but also by the Federal Government. In order to give the best possible service at the lowest price and also on account of the peculiar conditions entering into the manufacture and sale of the product all public utilities are of necessity natural monopolies and public service regulation by commission is a recognition by the State of the monopolistic character of such enterprises. The favorable showings made by the central-station companies in reducing the cost of electricity to the consumer and in increasing the efficiency of their service is due mainly to a reduction in the capital expenses and to lower operating costs. The importance of the service rendered by a central station as an economic factor and, in fact, as a daily necessity, is indicated by the volume and diversity of its business. Such economic agents are necessarily always undergoing great changes, with an accompanying increasing tendency toward consolidation with a view to concentration of the source of supply from which radiate widespread transmission lines to convey the electric energy to its several and diversified points of application.

To a greater extent than ever before these lines are crossing state lines and serving various municipalities, thus being subject, as before mentioned, to State as well as Federal regulation. It is not to be presumed, however, that any regulation, however discriminating and harassing, will prevent the proper and continued development, on an increasingly larger scale, of the central-station industry, the great benefits of which have only commenced to be realized and appreciated at their real value. It is not sufficient to know that the concentration of the power supply avoids economic waste and creates a new factor in civilization, but it is imperative that the public must also realize that in order to efficiently and continuously carry on the work that has been started, interference by regulating commissions should be temperate, intelligent and based on logical premises and not on whim or fancy or on the political considerations of the moment. Regulation, properly and intelligently exercised, should be and is of great value to the community and also to the central stations as by standardizing its rates and practices a more equitable situation as between producer and consumer has been brought about. In the past policies were in force and so carried out that they worked injustice to the consumer and caused the producer to be generally regarded with odium. Rates were not standardized and when the exigencies of the situation seemed to warrant, a rate was quoted that would get the business, thus discriminating as between consumers and without regard to the amount of electricity used.

Difficulties of Municipal Ownership.

Considering municipal ownership and operation of public utilities we find that, so far as the central station is concerned, such ownership has, in the past, been confined to the cities and has not been carried on in the extensive manner generally practiced by the up-to-date privately owned and operated corporation. This plan of operating the modern public utility by popularly chosen officials meets with a serious and economically destructive handicap from the start. It is difficult to find competent men for private employment with all its investigations and safeguards, but in the public service none of the safeguards against inefficiency exist. Under our present system of frequent rotation in office, party politics, under one name or another, is the determining consideration. However efficient an official may be the mere fact that he does not accept one party affiliation rather than another is sufficient cause for his removal from office and the substitution, for the time being, of another man who bears the right party designation. The efficient and honest official is ousted from office at the very time when his effectiveness in the public service is at its maximum. Nothing requiring special skill or ability can survive such a system. Unnecessary men, often inefficient and incapable men, are added to the payroll merely to pay a political debt by gratifying the personal caprice of the individual affected and regardless of qualifications or necessity. Duplication, as in Cleveland, for example, on an economically destructive scale takes place, for all of which the public citizen, the taxpayer, pays in the long run. Taxation for the purpose of revenue is one of the basic principles of any government. With a municipally owned and operated utility, while it is of course possible to regulate the price of the product for sale and to bring this price below that charged by a potential competitor this price for service must provide an income that makes possible an economic return or else the deficit must be made up by the taxpaper. The public possesses the power to regulate taxation and can at any time adjust the payments of the corporation to a fair percentage of the value. Through control, by regulation and taxation, of the price of the service rendered the public possesses the power of preventing any kind of abuse as it can always compel the maintenance of an excellent standard of quality of service.

Municipal Plants Not Economically Conducted.

If what experience we may have had for our guidance has not taught us that public enterprises, whether city, state or Federal, cannot be or are not conducted as economically and efficiently as under private ownership, it should yet seem plain that this must necessarily be true, for the chief incentive of all business is gain and no business can be permanently profitable which fails to serve its patrons effectively or is heedless of the need of economy. With a municipally operated enterprise no such incentive exists and no need of economy is plainly apparent. It is not the business of a municipality, a state or a government to make money and while officers selected may be, and generally are, quite as honest as the officers or heads of private business enterprises, they are not expected to earn money, and where their duties involve its expenditure, they are not of necessity concerned over the fact that the department over which they preside is not being operated at a profit, since appropriations may be confidently looked for in case of a deficit. As their incomes are fixed and their tenure of office is frequently uncertain, they lack the spur which the promise of increased income as a reward for efficient work affords. They cannot count upon a term of service long enough to make worth while a complete mastery of a business so technical and so highly specialized as the manufacture and sale of electricity.

In the possession of these powers does it not seem wiser to all to add great volumes of private capital to our public resources, rather than to withdraw this capital from our municipal treasuries or from expenditure for other more desirable, and often necessary, uses? Does it not seem preferable to keep the great army of employees of our public utilities in efficient and stimulating private employment rather than in inefficient and parasitic public employment? Where the service rendered is adequate and good and the price fair; where the interests of the public and that very near part of the public, the employees, are given just consideration; where, in the larger sense, the higher responsibilities of public service are recognized, private ownership must in the long run appeal to the sober second thought of the people and will undoubtedly prevail as one of the economic creeds of our industrial and political life.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

An Electrical Laundry Process Combined With Electric Motor Drive.

The advantages of electrical drive for laundries are so numerous that the leading plants of this industry are now equipped for this form of power, but there is another application of electricity that has passed the experimental stage and is worthy the attention of the central station of every city as a means of increasing the demand from one of its large laundry customers. This adaptation consists in using the current directly as an aid in cleaning everything brought to the plant.

The Model Laundry at Nashville, Tenn., which is considered the largest plant in that city, has been using this process since December 1 with highly satisfactory results, both from the standpoint of the owners and from that of the Nashville Railway & Light Company, which is supplying the energy. The electrical method of washing, in which electric current replaces various chemicals in the washing machines, has benefited the laundry both by a reduction in the cost and by increasing the patronage. The saving in washing cost is estimated by the owners of the plant at 25 per cent, but at the present time the saving reaches about 40 per cent, owing to the high price of chloride of lime and other chemicals, which would otherwise be used to remove dirt. In addition, there has been an increase of business, it is stated, of 15 per cent, since the use was begun. The electrical process has proven more efficient in every respect and has been, both directly and indirectly, an excellent advertising feature.

The Model Laundry has been an electrified plant for the past six years, every machine used in its laundering work being operated by electricity.

The actual operation of the electrical process is a simple one. It is merely conducting an electric current by means of a salt solution through a tub in which a shell, containing the articles to be washed, rotates.

The first step is transforming the 220-volt alternating current from the central station lines to 110-volt direct current, by means of a seven-kilowatt, motor-generator. The current is conducted to a small vat in which the salt water is heated and also to the washing machines, of which there are 19, arranged in three rows.

The salt water consists of a solution of 27 pounds of salt to about 100 gallons of hot water. This runs through a small vat, holding a set of carbon plates, through which a 30-ampere, 110-volt current passes. This electrolysis releases a small amount of chlorine. The current also serves to keep the water hot. The temperature need not be as high as when chemicals are used, water heated to 160 degrees Fahrenheit being as effective as boiling water in ordinary methods.

The water is then piped to the washing machines. An automatic valve regulates its entrance to the tubs, and every precaution is taken here to prevent grounding. Every bolt and screw is carefully insulated and an insulated gasket inside the pipe prevents any contact between the water and the pipe.

The tub consists of a large wooden cylinder, the largest being about three feet in diameter and 54 inches long, holding 100 shirts. The shell is perforated, so that the water constantly splashes through the garments, and the direction of rotation is reversed at each half-turn, to assist in the washing. Pure soft soap is added to the water by the operator.

When the electrical process was installed, a crescent-shaped plate, alloyed of aluminum and lead, was placed at each end of the tub, with a thin insulating plate guarding it. The wires were attached to these plates. A post at one end holds two switches and an indicator lamp, the socket for the latter being so arranged that the current cannot be switched on unless the lamp is in place. Besides the switch controlling the current, there is a double-pole reversing switch, which on being turned once a week, reverses the direction of the flow of the current through the washer. This causes uniform wear on the plates and also serves to remove the dirt collecting on the positive plate.

The use of the electric current as a cleansing aid pre-

Battery of Motor-Driven Washers in Model Laundry, Nashville, Tenn.

Electric Irons, Motor-Driven Mangles and Other Machines, Model Laundry.

vents the injury to the garments caused by chlorides and other "biting" chemicals ordinarily used by laundries. While the latter are claimed to affect dyes, the current fixes them more strongly, so that white clothes, instead of becoming gray through continued washing, become whiter, and colored articles are made to hold their colors. The electric current also is a germicide. The Model Laundry has made a number of tests of this and bacteriological analysis has shown that the rinsing water of electrically washed clothes is purer than the city's filtered water.

The Model Laundry has, of course, featured its process in its advertising and in addition the improvement in the work done has made a strong appeal to the public, resulting in a big increase in business.

The current required for this process has averaged about two amperes per machine, for 10 hours a day. The average consumption has been 860 kilowatt-hours per month. As the water in the machine is changed several times during each washing and the current is on only between the time the tub is filled and the draining is begun, there is not a constant consumption.

The plant has, in all, 40 motors, with a total of 58 horsepower. These range in size from ⅛ to 10 horsepower. The smaller motors are direct-connected. The washing-machines are driven by three 10-horsepower induction motors, which, with the motor-generator set, are placed on a balcony. Each motor is connected by a belt drive to a shaft running one of the rows of washers. The motors on all machines are left running throughout the day, requiring no attention from the operators, most of whom are girls. Motors have required no attention except for regular oiling by the machinist of the plant.

The manager of the plant, D. D. Canfield, considers that electric drive has proven a success for many reasons. One of them is that in a laundry it is frequently desired to add a new machine or to shift an old one and this can be done without considering the position with reference to line shafts (except for washers). The only belting is that on the washing machines, which are operated by men, and on which the belts may be placed out of danger, so that there has never been any serious accident. With steam, it is a practical impossibility to keep soot from coming in through

Vat, in Foreground, in Which Water is Electrically Treated and Heated.

belt-holes, adding to the expense of washing. Finally, electricity has been more economical, it being estimated that $2,500 a year is saved in power costs. This estimate is based on the saving in wages of an engineer and fireman, the interest on an investment of about $10,000 in boilers and the difference between the cost of fuel and upkeep and the present cost of electric power.

The electrical washing process is controlled by the Electrical Washing Machine Company, which sells the right to its use to one laundry in each section, the price being based on the population and amount of business done. The company supplies the various additional equipment necessary and contracts with local concerns for the installation under its supervision.

Motor-Driven Pump Saves City $2,000 in Cleaning Reservoir.

By installing a motor-driven centrifugal pump for the purpose of cleaning its 51,000,000-gallon reservoir, the city of Nashville reduced the cost of this operation nearly two-thirds. When the reservoir was given its last general cleaning by means of hand-scrapers, in the latter part of 1913, the expenditure was $4,200. This did not include, however, the labor of city workhouse prisoners, who composed one-third of the force employed on this work. This year the city's payroll on this work on which only free labor was used, was $1,625, while the cost of the motor and pump was $725, so that it was paid for by its initial use. The cost of the energy, which was purchased from the Nashville Railway & Light Company, was approximately $40. The work required 1,500 kilowatt-hours.

Probably of greater importance than this saving, however, was the reduction in the time required from one month to eight days, the work being started May 16 and completed early May 25. The reservoir is divided into two basins and it is necessary to have half the supply cut off during the cleaning process. This renders it necessary to supply a small section with untreated water and for this reason it is desirable to reduce the time as greatly as possible. However, even this will be obviated in the future by brick dividing walls inside each basin.

The motor used was a 35-horse-power, single-phase, 110-volt, 60-cycle motor, operating at 1,165 revolutions per minute. It was placed over the well in which the raw-water supply was received and pumped to a 3-inch main running over the weir which was built at the top of the dividing wall. The main had connections about ten feet apart so that the hose pipes which were used could be moved about more easily. The stream at each hose had a pressure of about 75 pounds and the material was moved rapidly.

The motor and pump, which are direct-connected, are mounted on a crane and will be used whenever it is desired to empty any of the wells. The reduced cost and time will also enable the waterworks department to clean the entire reservoir once a year. The new method was introduced by Commissioner Robert Elliott and the work was under the direction of Turner H. Morton, supervisor of the waterworks.

Boston Edison Company Takes on New Power Business.

Two steam plants, one gas-operated and one oil-operated plant, have recently been shut down in Boston Edison territory and electric power service substituted. On May 1 a new D schedule was put in effect, which was very favorable to power users of 50 kilowatts and over. New business secured includes the following diversified industries:

	Kilowatts.
National Metal Company, in metal furnaces	140
Albert & J. M. Anderson Mfg. Co., electrical manufacturers	250
American Steam Gauge & Valve Company	250
Holbrook, Cabot & Rollins, contractors	415
Babson-Dow Manufacturing Company, screws	165
Whitney, Lynch & Quinlan, dyestuffs	75
Hunt-Spiller Mfg. Corp'n, castings	125
American Tube Works, additional	600
American Express Company, for charging trucks	270
Pelham Trust, office building	150
Two hotels and two apartment houses, total	445

Power Campaign of the Public Service Electric Company.

The Public Service Electric Company, New Jersey, has inaugurated an extensive campaign throughout its different territories in the state to interest new users for electric power. A series of announcements, termed "Talks on Power," as shown in the accompanying illustrations, are being made in local papers in the various sections, setting forth comprehensive data and information regarding the advantages of electric power for industrial operations. Each announcement is about 8 by 16 inches in size, and is arranged to cover a specific condition of power service.

This campaign is directed to the manufacturing plant, with particular reference to the convenience and economy to be derived through using the company's service, and reproducing authentic statements from present consumers relative to the advantage and efficiency of central-station power. In each announcement attention is directed to the extent of the company's operations, comprising 22 generating plants and 61 substations with a total capacity of 300,000 horsepower, one of the largest interconnected electric systems in the country. At the present time power is supplied to over 10,000 concerns in the state.

Talk No. 1 is designed with a caption to appeal to the manufacturer who may be operating an individual plant for factory operation; prominence is given to a letter from a firm which has abolished its local plant in favor of central-station service, referring to existing conditions warranting the change. A brief argument along the lines of reduced cost of operation comprises the text, driving home the economical features of central-station power, as well as the other advantages attendant. Space is also given to listing a few of the company's consumers using over 1,000 horsepower.

Talk No. 2 covers the operation of the isolated plant in connection with central-station service for emergency. As in the first announcement, a statement is reproduced from a local concern directly along the line of the argument at issue. This talk is a direct appeal for the economy of central-station power to meet unusual demands, also introducing the idea of such type of service exclusively with the evident advantages enjoyed by the manufacturer. Similar to the first talk, reference is made to a few of the large power consumers of the company.

Talk No. 3, the last issued up to this time, is devoted to the power waste evidenced in the average belt drive, with an indirect appeal for the use of motor-driven machinery; a concrete illustration of power loss through friction of a main shaft drive is given. The letter reproduced from a Camden firm testifies to the satisfactory service derived through the adoption of central-station service.

This publicity campaign will be continued to cover all phases of power service as applies to factory and manufacturing operations, the different talks appearing each week. The idea is interesting in the singling out and appealing to the different industries in the interests of central-station electric service, and closely followed by personal calls and co-operation in response to inquiries, the campaign will undoubtedly result in a decided increase in the number of power users for the company.

Campaign on Electric Glue Pots Instituted in Boston.

The Boston Edison Company is canvassing all carpenters, builders and box makers in its territory for the introduction of electric glue heaters. A circular letter with facsimile signature of W. G. Stetson, superintendent of the appliance department, calls attention to the low cost of operation, safety and ease of use. The one-quart size costs only about one cent a day to keep the glue in perfect conditions for use. Heaters of one, two and four-quart capacity are offered on 30 days' trial.

Three of a Series of Newspaper Advertisements Published by the Public Service Electric Company in Its Campaign for New Power Business.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

WIRING IN VERY DAMP PLACES.

Interesting Features of and Special Methods Used in Wiring a Dye House.

By William T. Estlick.

The inside wireman is frequently called upon to handle some difficult jobs of all kinds both for lighting and power service, but there is one class of inside work that calls for very careful thought and consideration. It is the wiring of very damp places, such as dye houses, packing houses, etc.

Before wiring a new dye house some time ago, the writer consulted several other electricians as to their experiences in wiring such places; although neither had had actual practical experience in such work, they advocated the use either of lead-covered cable or lead cable in conduit. It seemed to the writer, however, that in the case of using lead-covered cable this would make a rather expensive installation, if single-conductor cables were used on the three-wire, three-phase system employed in the plant, and if three-conductor cable were used, it would be rather difficult to make good splices, especially after the main cable was installed and fastened in place; even should the splicing be well done, it would be difficult to insulate it perfectly and permanently so as to prevent moisture, steam, acid fumes, etc., from creeping into the crevices in the insulation. In the case of lead-covered cable drawn into conduit, it would be still more difficult than in the foregoing case to make splices and the matter of draining the conduit would also have to be taken into account.

If a cabinet were installed outside of the damp department and the branch circuits run to its separate motors

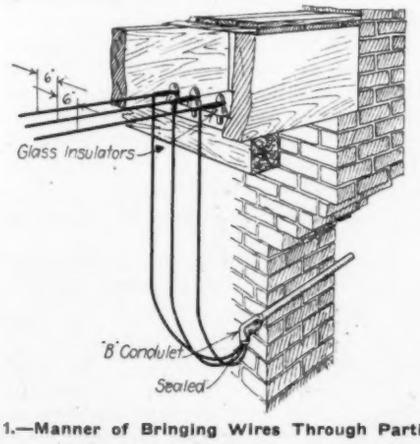


Fig. 1.—Manner of Bringing Wires Through Partition.

continuously without a break, such an installation would be first class. If a waterproof cabinet could be installed in the dye house and the branch circuits be made continuous therefrom, that too would make a good job. But in the case mentioned an installation of this type would have involved too much expense.

After careful consideration it was therefore decided to run a main line through the center of the dye house. This was run as a three-wire line, the wires being mounted on glass insulators six inches apart and installed in a way similar to outside wiring. Double-braided, rubber-covered wire was used. The wooden insulator pins were first well soaked in warm shellac and allowed to dry, then they were installed on the beams about 10 feet apart; upon this were placed the glass petticoated insulators. When

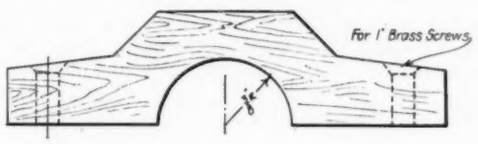


Fig. 2.—Special Impregnated Wood Cleat.

the wires were pulled up and fastened in place the installation presented a very neat appearance.

Just outside of the dye house was placed the main cutout switch in a cabinet and the conduit run from this cabinet through the partition into the dye house. A type B Condulet with a porcelain cover was placed on the end of the conduit, which was carefully sealed to prevent moisture from getting into the conduit system. The general arrangement is shown in Fig. 1.

Since putting the branch lines on insulators would mean a great deal of work and drilling so as to fasten the insulators in place, and since the machinery and apparatus did not permit loose wiring on the side or even open wiring, another scheme had to be devised. The branch-circuit wire was placed in flexible tubing which was taped and varnished to make it waterproof. It was fastened by

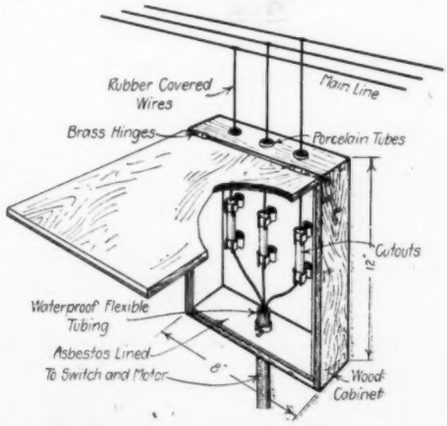


Fig. 3.—Special Branch-Circuit Cutout Cabinet.

means of wooden cleats which were cut out on a band saw; these were also soaked in warm shellac and fastened with wood screws. Fig. 2 shows one of these cleats. These were used in place of ordinary pipe straps because the latter might injure the tubing and would be subjected to corrosion, which would undoubtedly prove injurious to the wiring.

Where the branch lines were connected to the main line, the splicing was thoroughly made and all soldering flux used carefully wiped off. The joint was then well insulated and two coats of varnish applied. The wires were run to a wooden cutout cabinet, which was also dipped into warm shellac and lined with asbestos. This cabinet was made with a door with the hinges at the top, as shown in Fig. 3, and was placed at the side of the upright pillar under the beam, leaving a space of about 12 inches for the wiring; this was done to prevent the water leaking from the ceiling onto the top of the cabinet. The door of the cabinet was always kept closed. The wires entered the cabinet through porcelain tubes taped and sealed, and the flexible conduit was fastened to the bottom of the cabinet and also sealed. This tubing was made continuous from the cabinet to the switch and from the switch to the motor. Wherever the tubing entered or left the cabinet or switch any space left around it was carefully filled up to prevent moisture from getting in.

Although the writer did not obtain prices enabling him to judge of the cost of wiring with other materials for the sake of comparison, it is very evident that the installation as described was far more economical and flexible than any other could have been. This method of installation is very flexible because additional motors can be connected anywhere along the line and the inexpensive method of installing them compared with the other methods mentioned at the beginning of this article, warrants its use in such places where it is difficult to properly install and insulate a conduit system where such a system would last only two or three years at the most.

When the insulation becomes affected it is only necessary to take advantage of a day when no work is being done in the department, such as Sunday or any other holiday, and while the room is dry and then varnish or shellac the entire system. This gives a slickered appearance to the entire outside. The steam which condenses and the water which drips from the ceiling onto the wiring readily runs off before it has a chance to penetrate the insulation.

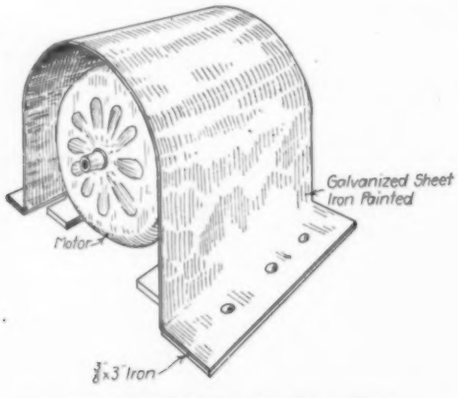


Fig. 4.—Galvanized-Iron Shield for Motor.

All the motors used in this dye house were incased in a wooden inclosure as far as possible and where this was not possible the motors were protected from dripping water by means of galvanized-iron shields made up as shown in Fig. 4 and well painted.

Operation of Motor-Generator for Motion-Picture Use.

On account of the very large number of motion-picture theaters considerable interest attaches to problems connected with the operation of their electrical equipment. A peculiar case involving a motor-generator set used for this purpose has been called to our attention by J. W. Thorne, of Beaumont, Texas.

This set included an alternating-current motor and a direct-current generator, the latter being compounded and having its series and shunt fields differentially connected. In changing from one picture machine to the other, both arcs are on for a short time. This doubles the series-field excitation, which would bring the generator voltage down too low for good operation. To prevent this, a change-over switch is used which cuts a resistance in series with each arc, thus maintaining a high enough voltage across the shunt field to give the proper operating voltage.

It was found that when a cold carbon was started, with only one machine in service, the arc became so dim for about a minute that it almost went out. The resistance of the cold carbon was evidently so low that it allowed a heavier current to flow through the arc, thus strengthening the series field, which caused the voltage of the machine to fall. It was therefore suggested to leave the change-over switch open with the resistance in series until the carbon got hot and it was found that this remedied the trouble. The machine is now used continuously without a flicker.

Duties of Boston Edison Company's Construction Bureau.

The functions of the construction bureau of the Boston Edison Company, and its relation to the several other departments, were outlined by L. L. Elden, head of the electrical engineering department, at a recent hearing before the Gas and Electric Light Commissioners of Massachusetts.

When an extension to plant, like a new substation, is decided upon, the electrical engineering department decides on general features, like capacity, number and voltage of units, number and character of switchboard panels; and lays out the requirements in diagrammatic form. This is the basis of an estimate which is made from general prices, showing about what the total cost will be.

The construction bureau, once the authority to build is obtained, draws the plans, works out details of wiring, and looks up all the data necessary for the purchase of instruments and everything that goes into the substation, the object being to deliver to the operating department a station entirely complete.

Having prepared the plans with details of material to be purchased through the purchasing bureau on a contract or a number of different contracts, the construction bureau has to follow up the progress of the work, the manufacture of the machinery, its factory testing, installing and final acceptance.

In the case of a conduit line, the electrical engineering department makes a sketch showing the street and approximate location, where manholes are required with respect to street corners and customers' entrances, also indicating service connections, cable required and size of conduit. On securing authority for the expenditure, these data are turned over to the construction bureau.

The latter then makes soundings for manholes, makes test pits to determine whether there is any obstruction, and examines the city records to find out where other conduits and pipes are in the street. It procures permits from the city government for the excavation, draws the plans for the contractor to work by, and arranges for the exact location. It secures permission from abutting owners to put pipes into their premises, and finally makes ready to start excavating. In case obstructions are met, or quicksand, new plans may have to be prepared, as it is often necessary to make detours to avoid something not shown in the city plan, as a cesspool, old manhole or possibly abandoned piping system. It devolves on this bureau to pay the contractor the extras involved in this special construction, and finally to deliver to the operating department the completed conduit line, with cable installed, ready to operate. The construction is done, as a rule, by a construction firm under contract.

Alternating-Current Motor Windings

By Justin Lebovici

This is the first installment of a new series of articles dealing with the windings of alternating-current motors and is supplementary to the series started in our issue of April 22, dealing with the general characteristics of motors. The present article deals with single-phase windings. Subsequent articles will discuss polyphase windings of open and closed types, mechanical construction of windings, etc.

In all rotating electric machinery, be it direct-current or alternating-current, motor or generator, the windings consist of conductors moving in relation to a magnetic field, thus cutting flux and generating an electromotive force

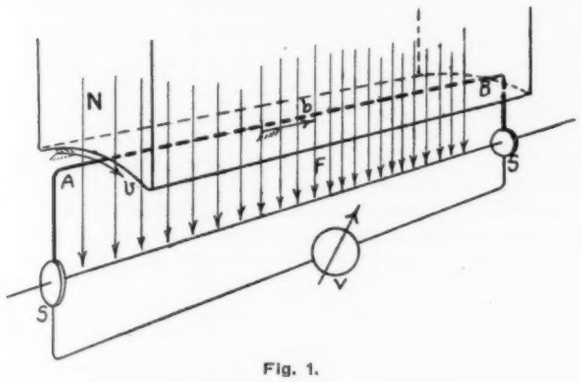


Fig. 1.

between the ends of the conductors. Assume a magnetic field F (which in order to fix our idea may be assumed to be produced by the north pole of a direct-current machine) and a conductor AB moving across the face of the pole in the direction of the arrow v. An electromotive force is generated between the ends A and B of the conductor AB, due to the conductor cutting the flux F of the pole N.

If we connect the points A and B by means of slip rings S S to a voltmeter V, it will indicate a difference of potential. For the above assumptions the point B will be at a higher potential than point A. If we replace the voltmeter by an ammeter, the latter will indicate a flow of current, the direction of flow through the ammeter being from the point B of high potential to the point A of low potential (arrow b).

In the case of the generator, the conductor AB is the seat

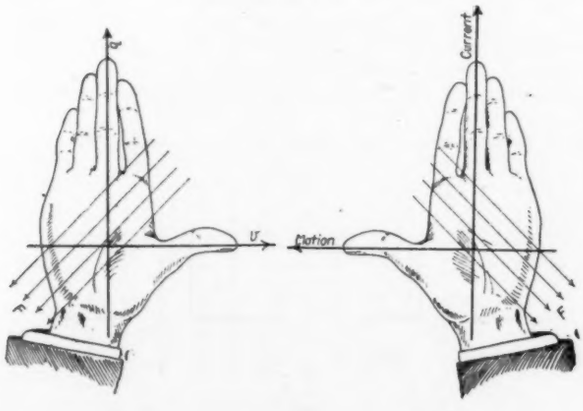


Fig. 2.

Fig. 3.

of an electromotive force which drives the current through the meter.

The direction of arrow b in Fig. 1 can be found by means of Fleming's right-hand rule. Imagine the right hand so placed in the magnetic field that the flux enters the palm and the thumb indicates the direction in which the conductor moves in relation to the magnetic field (arrow v in Fig. 2). The fingers will then indicate the direction of the resulting electromotive force (arrow b).

In the case of a motor a current is sent through the conductor AB (see Fig. 1) and, due to the interaction of the conductor and field, a force will ensue and may cause motion. In consequence of this motion the conductor AB cuts the field F as in the case of the generator, and an electromotive force is generated between the ends of the conductors. To this is given the name of counter electromotive force, since it always opposes the electromotive force applied to the conductor terminals, producing the current. The direction of resulting motion can be found by means of Fleming's left-hand rule. Imagine the left hand so placed in a magnetic field that the flux enters the palm, and the fingers indicate the direction of current flow. The thumb will then indicate the direction of the resulting motion (Fig. 3).

The direction of the flux F is always from a north pole N

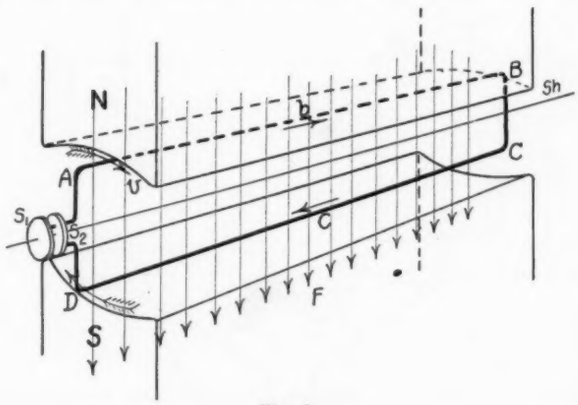


Fig. 4.

towards a south pole S, as shown in Fig. 4, which may represent the magnetic field of a bipolar direct-current machine.

Consider now two conductors AB and CD in Fig. 4 at diametrically opposite points on the surface of an armature, rotating clockwise, as indicated by the arrow v. The voltages generated in AB and CD have respectively the direction of arrows b and c.

If we connect conductors AB and CD by a wire BC, the electromotive forces generated in AB and CD will add up to a resultant voltage which can be measured between two slip rings S_1 and S_2, mounted on the same shaft as the armature carrying the conductors AB, CD. The connections BC, AS_1 and DS_2 are called end connections. AS_1 and DS_2 are called leads.

The conductors AB, CD, together with the end connections BC, AS_1, DS_2 constitute a winding element.

Winding elements variously interconnected to meet electrical requirements such as output, speed, voltage, frequency, number of phases, etc., constitute the electrical windings to be described in the following.

Logically our problem is three-fold:

(1) To arrange the conductors around the armature (conductor diagram).

(2) Connect the ends of the conductors to form a winding (winding diagram).

(3) See that the conductors and end connections form mechanically and electrically a structure which will withstand the various forces acting on same.

We will treat (1) and (2) together and will develop the rules for laying out the conductor and winding diagram.

The Conductor Diagram.

If we connect the points *A* and *D* in Fig. 4 directly through

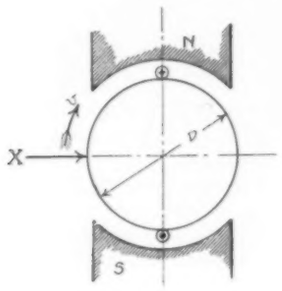


Fig. 5.

a wire we obtain a closed loop through which a current circulates in the direction of the arrows *b* and *c*.

Fig. 5 shows the end view of Fig. 4, looking toward the collector rings S_1 and S_2. Since we look upon the feather of the

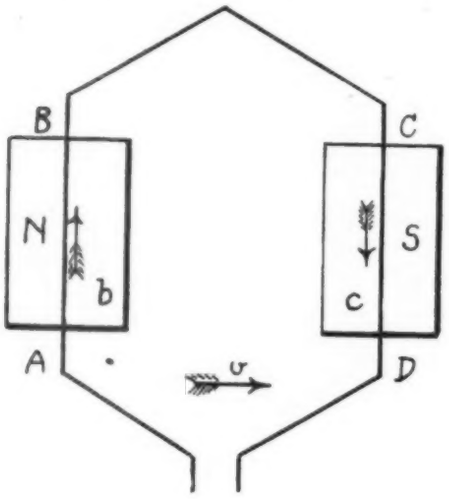


Fig. 7.

arrow *b* (Fig. 4) we will indicate the direction of the current in the conductor *AB* by a cross. Looking at conductor *CD* we see the point of the arrow *c*; hence we will represent the

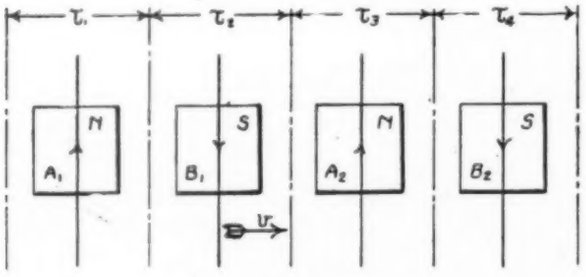


Fig. 9.

direction of the current in conductor *CD* in Fig. 5 by a dot. The direction of rotation of the armature is indicated in Fig. 5, same as before, by arrow *v*.

In Fig. 4, by connecting the conductors *AB* and *CD* with the end connections *BC* and *AD* we have formed a loop through which a current is circulating as indicated.

We could have obtained the same current flowing in the conductors *AB* and *CD* if, instead of connecting the conductors, as shown in Fig. 4, we would have connected the conductors

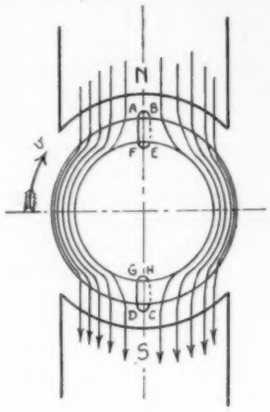


Fig. 6.

AB and *CD* as shown in Fig. 6. In Fig. 6 the armature is a ring, while in Fig. 4 the armature is a cylinder.

We are thus led to two fundamentally distinct types of windings and armature constructions:

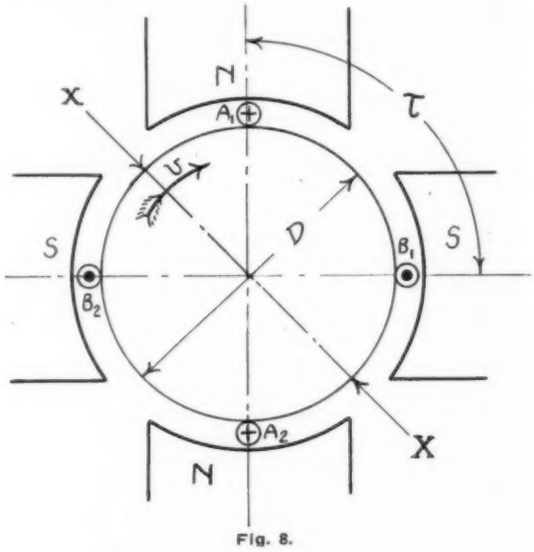


Fig. 8.

(*a*) The ring winding shown in Fig. 6.

(*b*) The drum winding shown in Fig. 4.

The ring winding and armature construction, invented by

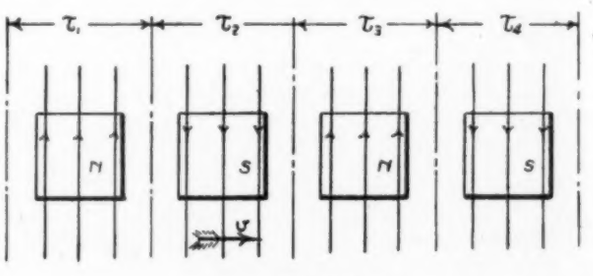


Fig. 10.

Pacinnotti and Gramme, was very much used in the early days of dynamo construction, but has been almost completely abandoned today and replaced by the drum-type of armature and winding.

The ring winding will be described in future only because it lends itself readily to diagrammatic representations of phe-

nomena occurring in all kinds of dynamo-electric machinery.

Referring to Fig. 4, it can be easily seen that only the part of the conductors AB and CD directly under the pole faces N and S are effective in generating voltage; the rest of the

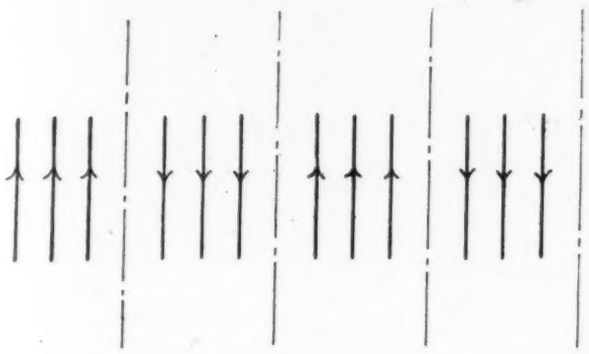


Fig. 11.

conductors AB and CD, as well as the end connections BC and CD, are useless as far as generating voltage is concerned.

Since the distribution of flux in a ring armature is as indicated in Fig. 6, the conductors EF and GH are not cutting magnetic flux and in consequence do not aid in generating voltage. EF and GH then greatly add to the amount of idle copper, as compared to the drum winding shown in Fig. 4. This is one of the reasons why the ring winding has been abandoned; other reasons will be given later.

A more common representation of Figs. 4 and 5 is obtained by showing the poles N, S and coil AB CD developed in a

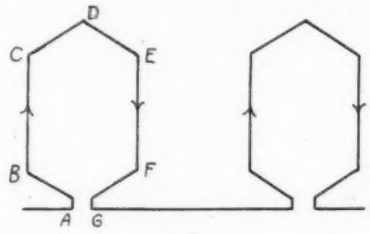


Fig. 13.

plane, as indicated in Fig. 7—all notations having the same meaning as in Fig. 4. AB and CD are the active conductors. BC and AD are the end connections. In Fig. 7 the position of conductor AB coincides with the center line of pole N, and CD coincides with the center line of pole S. The distance between the center lines of two consecutive poles measured around the armature surface is called the pole pitch and usually designated by the Greek letter τ.

If D is the diameter of the drum or armature in Fig. 5, the pole pitch

$$\tau=\pi D/2$$

and is expressed in inches if D is measured in inches. The pole pitch may also be measured in degrees and in the case of Fig. 5 we have, since the whole circumference corresponds to 2π or 360°,

$$\tau=\pi=180°.$$

In Fig. 7 the distance between conductors AB and CD measurged around the armature is equal to the pole pitch. The distance between AB and CD measured in this way is called the coil pitch or winding pitch.

So far we have dealt only with two poles and one conductor under each pole. We can imagine the diagram shown in Fig. 5 cut open at the point X and spread until it coincides with the part XA_1B_1X in Fig. 8, and an identical part XA_2B_2X added to it as shown in Fig. 8. We obtain in this way a four-

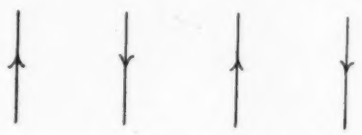


Fig. 12.

pole arrangement. By opening Fig. 8 at a point X and inserting one more pair of poles we would obtain a six-pole arrangement. Any multipolar arrangement can be considered as resulting from an addition of bipolar elements.

The pole pitch τ in Fig. 8 becomes

$$\tau=\pi D/4$$

or generally, if we call p the number of bipolar elements making up the multipolar machine, or the number of pairs of poles,

$$\tau=\pi D/2p$$

It is convenient when measuring τ in degrees to assign to

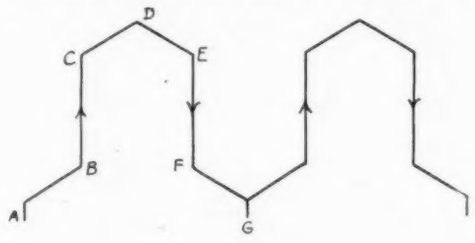


Fig. 14.

the pole pitch the value 180°, and to distinguish it from the actual mechanical angle, they are called electrical degrees.

Developing Fig. 8 in a plane we obtain the conductor diagram shown in Fig. 9.

In Fig. 9 we still show one conductor only under each pole. The conductors are usually laid in slots evenly distributed around the stator or rotor periphery. Fig. 10 shows the same conductor diagram as Fig. 9 but shows three conductors under each pole. If we apply Fleming's right-hand rule to any conductor along pole pitch τ_1, we obtain the same direction of current. Since the arrow indicating the direction of generated voltage and the polarity N and S presuppose each other for an

Fig. 15.

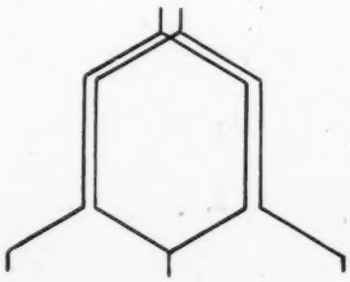


Fig. 16.

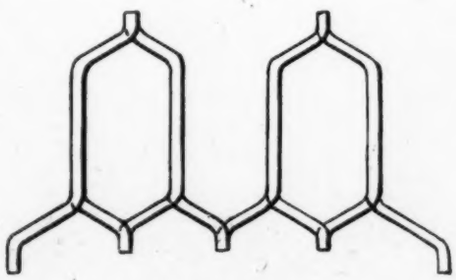


Fig. 17.

assumed direction of rotation, we may in future omit in the conductor diagram the poles and reduce the conductor diagram to what is shown in Fig. 11.

Since the scheme of end-connections we will employ to connect the conductors in Fig. 11 to a winding have no effect upon the amount of electromotive force generated, it is well to always start the winding diagram by laying out the simple conductor diagram shown in Fig. 11.

The individual conductors in the conductor diagram, Fig. 12, are most commonly connected to form coils according to one of the schemes indicated in Fig. 13 and Fig. 14.

The type of winding shown in Fig. 13 is called *lap* winding, while the type shown in Fig. 14 is called a *wave* winding. The winding element or coil *ABCDEFG* is, as a rule, completely formed to shape outside the machine in a manner to be described later. For our discussion the coils in Figs. 13 and 14 are made up of the two coil elements *BC* and *EF* and the end connections *CDE*, *AB* and *FG*. Actually *ABCDEFG* may and usually will consist of one continuous copper conductor and we speak of a *single-turn* coil. More of such single turns can be connected in series to form a *multiple-turn* coil. Such a coil is shown in Fig. 15. The leads may be brought out as shown in Fig. 15 or as shown in Fig. 16.

Fig. 17 shows a winding using coils illustrated in Fig. 16. In this case we still speak of a wave winding but this evidently refers to the way the leads are brought out. In all above diagrams the coils *ABCDEFG* may be made up of two or more wires in parallel. In the diagrammatic representations of windings we will treat the coil sides *BC*, *EF* and the end connections *CDE*, *BA* and *FG* as if they were single conductors.

(To be continued.)

Pipe-Bending Machine Economical in Telephone-Conduit Installation.

The New England Telephone & Telegraph Company has installed at its metropolitan construction department in Boston a pipe-bending machine for making the bends in conduit used for terminating the laterals for underground conduit lines to poles or building walls.

A right-angle bend of 3.25-inch iron pipe, with a 27-inch radius, is required. Formerly these bends were bought of jobbers at about 55 cents each. With the bending machine the cost is about 10 cents each, regular iron conduit being bent to required shape, and 10 to 15 bends being made per hour.

The machine consists of an iron form rigidly supported by a framework set in a concrete foundation. The form exactly fits the inside arc of the completed bend. Outside the form is a bending shoe swinging from links pivoted on the proper center and so connected by levers that it can be forced against the pipe, thus producing the desired curve by easy stages. Four men are required—three on the lever and one to set the shoe.

The pipe is not appreciably flattened by the process and uniform bends are now quickly and cheaply produced.

Pipe-Bending Machine.

PECULIAR DIFFERENCE OF POTENTIAL BETWEEN GAS AND WATER PIPES, BOTH SUPPOSEDLY GROUNDED.

By John L. Gleason.

A few days ago a neighbor called me in to explain to him why his maid was getting shocks from the range in the kitchen. She thought they were coming through the floor. The floor was covered with linoleum and I was unable to feel anything after touching both the coal and the gas ranges alternately, so, as the maid could not speak English, I told my neighbor that I thought it must be imagination on her part. Two days afterwards the same thing occurred and she wanted to "throw up" her job unless the trouble was fixed up. My neighbor also had a similar experience, so I went over again and could not get any shock until I happened to touch both the gas and coal ranges simultaneously, and then I got a good one, which I thought to be about 110 volts. I went back to the shop and brought a weatherproof socket with a 110-volt lamp and a couple of wire leads, and got full candlepower on the lamp between the two ranges.

This sort of "buffaloed" me, as I couldn't see why there should be a difference of potential between the gas and water service when both entered the building from a common ground. Realizing that one side of the secondaries was grounded, why should it not be a ground common with the gas service? It occurred to me that possibly one side of the circuit, opposite to the grounded side, might have become grounded ahead of the insulating joints at some of the combination outlets throughout the house, so I investigated this.

I took a 50,000-ohm magneto generator and found both legs of all the branch circuits were perfectly clear as were also the submains which ran from the distribution cabinet in the bathroom on the second floor to the meter in the basement. I then tried some "straight" gas outlets in the basement and found that I could get shocks from any of them when standing on the concrete floor. Then I pulled open the main service switch and the same conditions existed. I thought possibly the main service switch was leaking, but it proved to be all right.

The next thing which I decided to try was to put the 110-volt lamp across the gas and the water services, which were within a foot of each other in the basement wall, and found a difference of potential there of at least 110 volts. How much current was flowing I had no means of knowing, but I found it would melt a piece of No. 18 stranded lamp cord right off.

Having thus demonstrated that, as far as the building was concerned, the job was right, I notified the power company and it finally sifted down to the fact that a transformer in a manhole, some 200 feet away from this particular service, had a cable from it on which the lead sheath had become grounded on the copper conductor, and the current backed up into this house through the gas service and caused the bother. I grounded the gas and water systems where they entered the building with proper clamps, and No. 4 wire, thinking that injury to the transformer, rather than the house or its occupants, was the lesser of two evils. This transformer in the manhole supplied about a dozen different customers, all of whose gas and water services were examined to see if there was any difference of potential; but there was none with the exception of the house in question. The gas services common to the neighborhood are of 1.5-inch wrought-iron pipe, tapped into a three-inch iron main.

That there should be a difference of potential between the gas and the water service is a "new one" for me. Although I have been a master electrician and master gas fitter for 23 years, this is the first time I have experienced such a condition in any house.

The Reason Why—What It Was

By George W. Hill

This article is a sequel to the one by Mr. Hill published in our issue of May 27. It gives a simple and business-like solution of the problem then presented, which related to an apparently lucrative business proposition. The lesson taught is a very valuable one to electrical contractors and dealers and emphasizes the importance of knowing all cost elements in the business, particularly the overhead costs. It also shows how this knowledge can be instantly applied in analyzing any proposition.

In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of May 27 last, an article appeared under my signature, in which I attempted to describe a condition that is met with nearly every day in the year in the electrical contracting and merchandising business. There was displayed with this article a sample financial statement of a contractor, which the writer believed would make it perfectly apparent to all why it was that a certain dealer refused to place an order for an article, which cost the dealer $1.87 f. o. b. cars, New York City, and on which the manufacturer had established a resale price of $2.50.

On reference to the financial statement it will be observed that the overhead or operating expense was such that it would not permit any intelligent business man making such a contract under the circumstances.

Many contractors in looking at a proposition of this kind assume that $1.87 is the cost, while as a matter of fact the cost is $1.87 plus the freight and drayage and plus the overhead or operating expense.

Let us assume in this particular transaction that these articles were heavy and that the freight and drayage was 25 cents on each. Now let us take the average overhead expense of the contractors of the country, which is in my opinion about 33⅓ per cent, and I am frank in saying that I believe that there are many who have a greater rather than a smaller overhead. Adding the freight and drayage makes this article cost $2.12. One-third of $2.12 is 70 cents. This added to the cost delivered brings the cost of the article up to $2.82, or 32 cents above $2.50, the resale price established by the manufacturer through the columns of various periodicals, and which he insists upon the dealers maintaining.

I believe, if the manufacturers of an article are sincere in desiring to assist the contractor and dealer to make money and in placing him in a position to buy more goods and pay for them, that they should first consult the dealers and learn the average overhead per cent before attempting to establish an intelligent selling price.

While there are many manufacturers whose business methods cannot be questioned, some, however, rely wholly upon the contractor's ignorance of his costs in putting over deals of this kind.

If you will observe closely that when representatives come along with propositions of this kind, in which the selling price is less than one-third greater than the buying price, you will find usually that great stress is laid upon prompt payment. They make a decided effort to make an early settlement. They sometimes offer inducements for cash, and in such cases it is well that some contractors take advantage of this discount for cash, for this may be all that saves them from losing money on the transaction. They want your money before you wake up and become aware that the difference between the buying and selling price is not all profit. You have the goods on hand. You do your utmost to sell them, and by pushing them to save yourself, you perhaps create a demand for them among your customers, and the final result is that, in order to accommodate your customers, you are compelled to handle an article at a loss indefinitely.

This kind of business reminds me of a transaction which I witnessed not long ago. I was waiting in a small town store one day for a train, when a young salesman entered the store representing some soft-drinks house. He was selling some beverage by the barrel, and making contracts for the entire requirements for the season. He informed the dealer that he would furnish him with a beautiful imitation polished barrel with a fine nickel faucet. He would, as an extra inducement, furnish free of cost to the dealer, 12 fine, large steins or mugs in which to serve the beverage. The large, fine mugs closed the bargain. After the representative had departed with a perfectly good order to supply the dealer with his entire requirements for the season, the merchant began to think. He had contracted for several barrels of this beverage, and had permitted the agent to present him with large twelve-ounce mugs or steins, which he had agreed to use, while as a matter of fact, a six-ounce glass or mug was all any one person would care to have at one drink. It began to soak in on him that, if he used the mugs which were to be furnished him free of charge, he was going to give his customers twice as much beverage as they would require for a nickel. He began to see that in order to get the nickels from his customers he would be compelled to buy twice as much of the beverage from the company as he would otherwise require, if he used six-ounce mugs or glasses, and yet it was these self same mugs which he was to get for nothing that had induced him to make the contract.

Too many men enter into such contracts without thinking. Do your own thinking. Don't let the salesman do it for you. Just analyze the proposition from your own standpoint and not from all that is told you by the salesman. Don't be so anxious to get something for nothing. If you will investigate these "something-for-nothing" propositions, you will usually find that there is a string to the deal where it can be pulled back out of your reach.

Many of you have no doubt stepped out to the sidewalk on the first day of April and found to your surprise and delight, perhaps, that some unfortunate person had lost a big, fat pocketbook, but as you stooped to pick it up it disappeared. There was a string to it and, if you listened, you were able to locate the other end of the string, for presently, when you had retired a safe distance, you heard some boy or girl yell "April Fool." Just so in business. You may think that you have found a deal where you are going to get something for nothing, but about the time that you are ready to get away with it you will find to your dismay that it has disappeared and, if your eyesight and hearing are good, you will be able to locate the other end of the string. The fellow who is at the other end may not yell "April Fool," for it may not be April, but the season of the year does not alter the nature of the case.

Portland Prepares New Electrical Code.

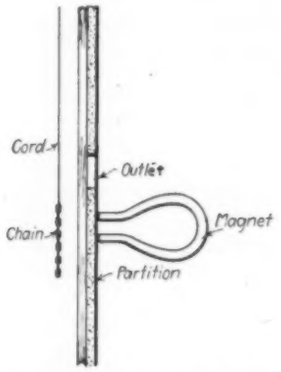
The City Council of Portland, Ore., recently passed a new electrical code, changed in a number of respects, to bring it up to the standards of the National Electrical Code. The changes pertain particularly to construction features, and are not of a nature to increase the cost of wiring, but rather tend to decrease the cost. City Electrical Inspector Dunlap and F. D. Weber, of the Underwriters' and Electrical Board of Appeal, prepared the code.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fishing to Wall Outlets.

In wiring old buildings for wall receptacles or switch outlets where it is difficult to hook a fish string or chain, take a piece of steel or iron fish chain about one foot long, tie to a strong string or cord, and drop between partition



Use of Magnet as Aid in Fishing.

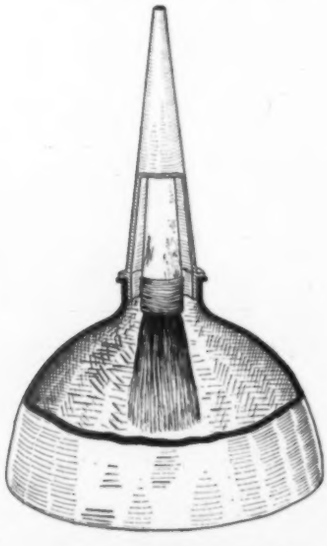
where the wall outlet is located. Take a strong laminated horseshoe magnet, or a small electromagnet which can be operated by one or two dry cells, and move the magnet in the vicinity of the chain and up to the hole. The chain will be drawn to the hole, where it can be caught by the fingers, or a small hooked wire.

Benjamin Swanson.

Receptacle for Asphaltum Paint and Brush.

In the accompanying sketch is shown what I have found to be an excellent method of carrying asphaltum paint in a wireman's tool kit. Take an ordinary machine oil can and a small round paint brush. Clean the can with gasoline or benzine. Cut the handle of the paint brush so it will fit into the spout of the can. Fill the can with the paint. This method of carrying the brush and paint keeps both in usable condition and saves much time in looking for a brush whenever the occasion arises on a job for using one.

John Bornholdt.



Oil Can as Paint and Brush Receptacle.

Screw Driver As Wire Guide.

When wiring sockets, receptacles, snap or flush wall switches, etc., it is customary to use a screw driver to

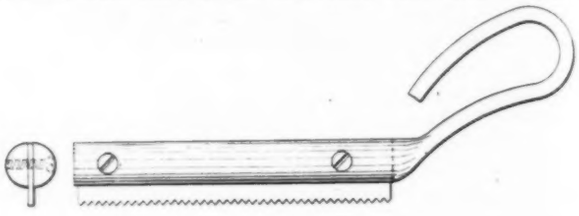
Screw Driver Adapted to Guide Wire.

guide the wire around the binding screws so that when these are screwed down their heads will hold the wire all around. In doing this with an ordinary screw driver it is apt to slip off the wire and therefore frequently break the porcelain. To prevent this, I file a notch in the middle of the screw-driver end as shown. This notch serves to hold the driver from slipping off and it therefore guides the wire more easily and quickly around the screw.

S. B. Trunkat.

Convenient Commutator-Slotting Tool.

A convenient little tool for undercutting mica between commutator bars is shown in the accompanying sketch. It can easily be made from one-half-inch half-round iron which will form



Home-Made Commutator Slotter.

a strong and comfortable handle. The piece of hack-saw blade is held between the two sides by two flat-head screws.

R. L. Hervey.

Reducing Bushings Made on the Job.

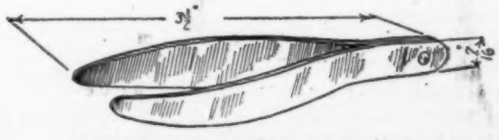
A great many electricians do not know that they can make a good serviceable reducing bushing from an ordinary coupling. It is possible to make a three-quarter to one-half-inch bushing from a one-half-inch coupling by cutting a three-quarter-inch thread on the outside of the coupling. In the same way a one to three-quarter-inch bushing can be made by threading the outside of a three-quarter-inch coupling. This scheme enables one to use a larger Condulet, Adaptibox or other fitting, than possible otherwise and also to change from one size conduit to another by means of these reducing bushings.

Charles Rubner.

How to Make a Pair of Tweezers.

Procure an old hack-saw blade and break it in two, using the pieces that already have the holes in the ends. Grind all the teeth off and taper somewhat, as shown in the sketch. Then rivet the two pieces together, after which the points, if necessary, can be bent a little towards each other. A good length would be about 3.5 inches long by seven-sixteenths inch wide.

F. A. Grohsmeyer.



Tweezers Made from Hack-Saw Blade.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Electric Lemon Squeezer.

Thomas Mills & Bros. Company, Philadelphia, Pa., has recently developed the electrically operated fruit-juice extractor illustrated. This outfit is suitable for restaurants, soda fountains and other places where it is necessary to extract the juice from large numbers of lemons or oranges.

Motor-Driven Fruit-Juice Extractor.

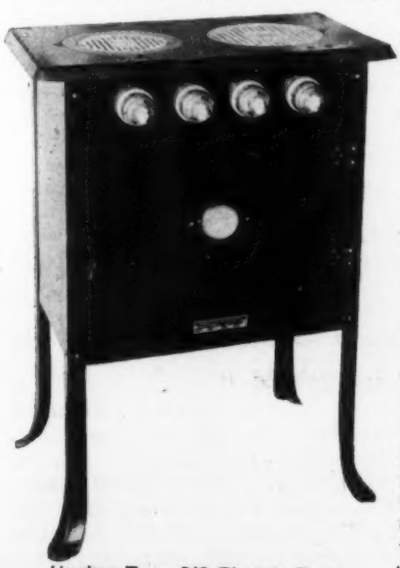
It consists of a motor-driven hemisphere provided with ribs similar to the ordinary hand-operated glass extractor. The lemon or orange is halved and held against this hemispherical part. The juice is caught in a deflector at the back and runs down through a spout at the bottom.

A clamp is provided for attaching the outfit to a table or counter and a ring is attached below the spout to support the glass.

The outfit is equipped with 0.1-horsepower universal motor made by the Robbins & Myers Company, Springfield, O.

New Inexpensive Types of Hughes Electric Ranges.

Purely through a popular demand which grew so large that it had to be recognized, the Hughes Electric Heating Company, Chicago, Ill., has brought out four new models of lower-priced electric ranges.



Hughes Type C18 Electric Range.

In many localities the central stations and the Hughes salesmen found that the cost of the standard line was too high for certain classes of the inhabitants and that there were great sales possibilities in a lower-priced range. In accordance with this waiting business, the Hughes company is now manufacturing a new line of all-black-enameled ranges which are much lower in cost, owing to the omission of fancy nickel-plated legs and trimmings, white-enameled splashers and other costly features. Another reason why these ranges can be priced so much lower is because their legs are not cast but formed from angle iron.

The lowest-priced range of this new line is the type C 18, which sells for $39.50. This range has a two-burner cooking surface, one unit with a maximum of 1,500 watts, the other 880; it also has a two-burner oven, each unit having a maximum of 880 watts.

The highest-priced stove of this group is the type C 4, which is of the cabinet type and sells for $70.00. It has a three-burner cooking surface, two-burner oven, an elevated warming shelf and a large open lower shelf. The maximum loads of the cooking burners are 1,500, 1,100 and 880 watts, and of the oven burners 1,100 watts each. The two other types vary in design and capacity between the small and the larger ranges illustrated.

To give some idea of the popularity of this inexpensive all-black-enameled line, 42 of the C 4 type were sold last week for installation in the new Imperial Arms Apartments in Portland, Ore. There is no doubt but that these ranges exactly meet the needs of thousands of housewives who are more interested in the utility, convenience and wholesome cooking qualities of electric ranges than in showy appearance of these appliances. These new Hughes ranges, from the electrical and cooking standpoints, embody the same high standards that have given Hughes electric ranges their excellent reputation.

Hughes Type C4 Electric Range.

Improved Disk-Strain and Pin-Type Insulators Invented by Louis Steinberger.

Because of the rapid increase in power transmission through high-tension lines special interest attaches to some radical improvements in the design and construction of disk-strain and pin-type insulators which have recently been invented and patented by Louis Steinberger, president and general manager of the Electrose Manufacturing Company, Brooklyn, N. Y. A few typical designs embodying these inventions are shown in the accompanying sectional illustrations.

A simple form of disk-strain insulator is shown in Fig. 1. It will be observed that the insulating portion in this case consists of two smooth outwardly flaring disks which are united in the body portion of the insulator so as to form an integral insulating body completely inclosing the mechanical strain members. The latter are metallic and are arranged to interlock so as to form an extremely strong structure, such that even though the insulation were totally destroyed the line could not fall to the ground. The outer ends of the strain members, in this case shown as eyes, can be unscrewed and replaced by clevises, threaded studs, sockets, etc., to meet special requirements. Between the inner metallic strain members, and completely insulating them from each other, is an insulating filler made of fireproof composition with very high dielectric qualities.

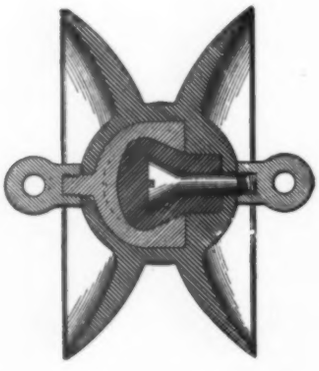


Fig. 1.—Section of Disk-Strain Insulator with Plain Disks.

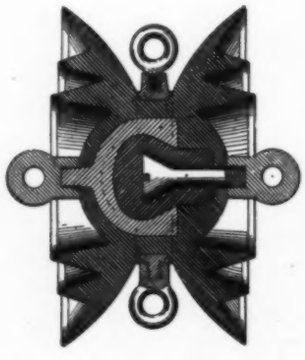


Fig. 2.—Section of Strain Insulator with Collars on Disks.

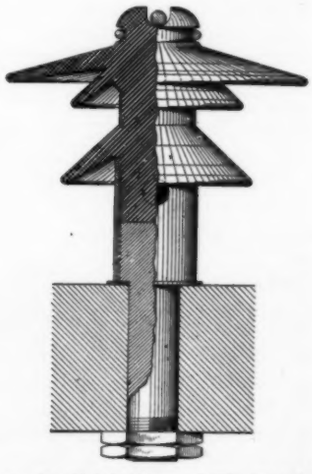


Fig. 3.—Partial Section of Pin-Type Insulator with Improved Pin Mounting.

Where it is desired to use a strain insulator on a line of much higher potential than that suited for the type of insulator shown in Fig. 1, the construction shown in Fig. 2 is employed. It will be observed in this view that the interior construction is similar to that already described. The chief feature of the latter modified type is that the disks are provided on their outer surfaces with outwardly extending ridge-like rings or collars, the whole being molded into a unitary structure. The object of these intermediate rings or collars is to increase the length of path between the ends of the strain members, thus making the device especially adapted to extremely high voltages. The design shown in Fig. 2 also shows that it is surrounded in the middle between the disks by a metallic ring to which are secured several eyes. This construction may be used for supporting arc lamps, etc., or where it is necessary to brace the strain insulator in several lateral directions.

A most important feature of these insulators is that the peripheral edges of the disks, and the outward edges of the intermediate rings or collars shown in Fig. 2, are provided with metallic annular shield rings. These serve to equalize the dielectric stresses and they also provide a convenient path for arcs, thus permitting the easy and quiet dissipation of their energy. These metallic shield rings also serve as elements of a condenser and thereby secure a uniform distribution of the electrostatic field about the insulator. In the case of abnormal electrical discharges, these shield rings also prevent puncturing the insulator, this being done without reducing the effective line insulation.

This capacity effect is also embodied in the design of the pin insulator shown in Fig. 3. Each of the flaring disks or petticoats is provided with metallic annular shield rings and the upper surfaces of these flanges have imbedded in them similar conducting shield rings. These various shield rings serve to dissipate thoroughly and rapidly any abnormal charge that tends to travel from the line conductor in the upper groove downward to the pin. These shield rings are arranged so that the discharge must pass over the surface of the flanges instead of through the body of the flanges or the insulator. They likewise serve to uniformly distribute the electrostatic field. The general theory of this design is that these shield rings provide an interrupted conducting path from the line to the ground which consists of alternate ring sections of extremely high and low resistances, the latter serving to distribute the charge and therefore to protect the insulator from injury due to confinement of the charge to a narrow path, while the portions of high resistance provide the high impedances to the passage of normal line current which is necessary to prevent grounding the line itself. These metal shield rings also serve to give greater mechanical strength to the insulators themselves.

Another very important characteristic of this type of pin insulator is the improved mechanical construction of its support. It will be observed from the sectional view that the pin does not penetrate the insulating body of the insulator itself but ends at the base of this body. The lower portion of the insulating stem is molded within a metallic sleeve, which also surrounds the top of the pin and gives great mechanical strength, without reducing the high dielectric strength of the insulator.

Motor Application to Bottle-Filling and Corking Machine.

The Standard Automatic Machine Company, Rochester, N. Y., has developed a machine that fills and corks bottles. One operator places the bottle in the jaws on the rotating part of the machine. This moves the bottle under a pump, which delivers a fixed amount of liquid to the bottle. The bottle is then carried on past another operator who places a cork in its neck and this is driven into place by a

mechanism through which the bottle passes. The jaws holding the neck of the bottle are then opened and the bottle slips onto a chute or conveyor on which it is carried away. The machine is unusual in that it combines both filling and corking in one mechanism and each bottle receives an accurate amount of liquid.

This machine is designed to operate at a number of different speeds to adjust for the capacity of the bottle, the number of pumps used, and the speed of bottling desired. It is equipped with a one-horsepower direct-current adjustable-speed Westinghouse motor.

Hospital Finds Novel Use for Electric Heater.

The Saint Mark's Hospital, of Salt Lake City, Utah, has a set of four dumb waiters running from the basement to the first, second and third floors carrying food from the kitchen to the various wards. Great difficulty was encountered in keeping the food warm from the time it left the kitchen until it arrived at its destination.

Mr. Chadron, general manager of the hospital, gave the problem careful study and finally designed and had built seven portable wagons. Each of these wagons accommodates 26 trays and is arranged with sliding doors that make the outfit practically air-tight. A Western Electric navy-type air heater is mounted on the bottom of the wagon with a cord and plug attachment capable of being connected ten feet away from the wagon. An hour before each meal the various heaters are connected to a source of electric current so that at mealtime the interiors of the wagons are satisfactorily heated. After the wagons are loaded with the trays of food, the heaters are disconnected and the whole contrivance is placed on the elevator and raised to its destination where the heater is again connected to the current supply and keeps the food hot.

Electrically Heated Food-Tray Wagon for Hospital.

The new system is in constant operation and it is found to work perfectly. The food is served to the patients quite as warm and palatable as when it left the kitchen range. The installation has been the object of favorable comment in hospital circles.

View in Dipping Room of The Findlay Electric Porcelain Company's Factory.

The many uses of porcelain in the electrical industry have resulted in bringing the manufacture of electrical porcelain to a very highly developed point. A great deal of study has been given to the properties of porcelain for insulating purposes and to the influence thereon of manufacturing methods. From these studies manufacturers have profited greatly and notably The Findlay Electric Porcelain Company, whose factory at Findlay, O., covers several acres and includes several departments. Above is shown a view in a department known as the dipping room, in which the glaze is applied to the ware. In the foreground can be seen stacked on drying boards several thousand Buckeye patented reversible split knobs for which the company owns the exclusive manufacturing rights. The company also manufactures the Findlay patented interchangeable self-centering split knob and a complete line of standard electric porcelain products of the highest grade. There are also facilities for making special porcelain according to special drawings and specifications.

INDUSTRY ACTIVITIES

The Borden Company, Warren, O., has published a 16-page catalog on "Beaver" die stocks and pipe cutters.

Leeds & Northrup Company, Philadelphia, Pa., has issued Bulletin No. 219-A, on its lamp and scale for use with galvanometers.

The Robert Skeen Electric Works is building a one-story business structure, 100 by 100 feet, at Ninth and Everett Streets, Portland, Ore.

Betson Plastic Fire Brick Company, Rome, N. Y., has issued a mailing folder which illustrates and describes Betson boiler furnace linings.

Christopher Bach, Jr., 192 Broadway, Milwaukee, Wis., is distributing a mailing folder describing an adjustable drill for cutting holes in wall cabinets.

The Pacific Electric Manufacturing Company, switchgear builders, formerly located at 80 Tehama Street, has moved to 827 Folsom Street, San Francisco, Cal.

Producers' Mica Company, 225 East Twenty-second Street, Chicago, Ill., has prepared Catalog No. 15, which gives price lists on mica for insulating and other electrical uses.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Descriptive Leaflet 3896, on pin-type porcelain insulators, and Leaflet 3827, on oil-well motors for pumping on the beam.

General Electric Company has prepared plans for four new buildings as additions to its River and Federal Street works at Lynn, Mass. Three of the buildings are to be used for manufacturing purposes and the fourth will be used for a dispensary.

The Electric Storage Battery Company, Philadelphia, Pa., has purchased a large tract of land adjoining its factory at Nineteenth Street and Allegheny Avenue, and plans are being made for the erection of additional buildings for manufacturing purposes.

Chelten Electric Company, Philadelphia, Pa., has issued its 1916 catalog of electrical specialties. These include several types of wall switches, receptacles, attachment plugs, fuses, switch boxes, etc. The catalog lists and illustrates these and also shows some of the important buildings in which they are extensively used.

Presto Electric Company, of San Francisco, Cal., recently purchased a site in Thirteenth Street, near Chanslor Avenue, Richmond, Cal., and will begin work shortly on a plant for the manufacture of electric appliances, which will cost $45,000, exclusive of machinery. It is expected the plant will be ready for operation about October 1.

Cutter Electrical & Manufacturing Company, Philadelphia, Pa., has issued a circular describing its recent publication on typical I-T-E circuit-breaker installations. The use of I-T-E circuit-breakers in several hundred plants is described and illustrated, the book being about 350 pages, 9 by 11 inches, neatly printed and bound. A limited edition is being distributed.

Calebaugh Self-Lubricating Carbon Company, Incorporated, 1511 Columbia Avenue, Philadelphia, Pa., has recently been receiving numerous pleasing letters from many users of its No-Spark carbon brushes. These users have freely attested to the excellent results obtained with these brushes for motors and generators. Among their improved qualities are sparkless commutation, self lubrication and practically frictionless operation, freedom from rapid wear, large capacity, etc.

Diehl Manufacturing Company, Elizabeth, N. J., has issued bulletin No. 106 on its type-G direct-current motors and generators.

Frankel Connector Company, 177 Hudson Street, New York City, has issued a booklet on its testing clips, spark plugs and solderless electrical connectors.

American Carbon & Battery Company, East St. Louis, Ill., is preparing plans for the erection of a new factory building to be used for the manufacture of flashlights.

Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill., is distributing a large mailing folder descriptive of the last drive in its 1916 campaign on Benjamin "92" sockets.

Deuth & Company, Incorporated, manufacturers and importers of incandescent lamps, announce the removal of their executive offices on June 1 from the Fifth National Bank Building to larger quarters in the Equitable Building, New York City.

Westinghouse Church Kerr & Company, engineers and constructors, 37 Wall Street, New York City, have issued a folder on the construction of the Canadian Pacific Railways at Calgary, Alta, Can. Centralized control in construction work is emphasized in the folder.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., announces that the C-H magnetic gear shift has been adopted by the Premier Motor Car Corporation, of Indianapolis, Ind., and will be standard equipment on new models shortly to be placed on the market by the Premier company.

Domestic Engineering Company.—J. A. High, president and general manager of the Home Electric Light Company, of Boston, Mass., was in Dayton, O., recently in connection with his representation of the Domestic Electric Company's product, "Delco-Light," in the New England States. The Domestic Electric Company, of New York City, will handle the new lighting system in parts of New York and New Jersey.

Western Electric Executive Offices Are Moved.—The executive departments of the Western Electric Company, Incorporated, at New York City, moved on June 5 from 463 West Street to new offices in the Telephone and Telegraph Building at 195 Broadway. The move was made necessary by the steady growth of the company's engineering departments which will occupy the space that has been vacated. The change also brings the executive departments in closer touch with the heart of New York's business district. The patent and the local New York distributing departments, as well as the engineering department, remain at 463 West Street.

Triangle Conduit Company has been incorporated under the laws of New York for the manufacture of armored conductor, flexible steel and non-metallic conduit at its factory established in Brooklyn, N. Y. The officers of the new company are James R. Strong, president; V. C. Gilpin, vice-president; J. E. McAuliffe, treasurer, and Francis W. Russell, secretary. Mr. Strong is well known in the electrical industry through his many activities and through his identification with many trade organizations. Mr. Gilpin and Mr. McAuliffe have been engaged in the manufacture and sale of products similar to those manufactured by the new company and have an extensive acquaintance throughout the country. The office of the company in New York City is at 2010 Broadway.

PERSONAL AND BIOGRAPHICAL

MR. C. H. KRETZ, who was elected president of the Gas, Electric and Street Railway Association of Oklahoma at the fifth annual convention, held in Oklahoma City, May 23-25, is manager of the Okmulgee (Okla.) Ice & Light Company. He was born in Baton Rouge, La., and was educated at the University of Louisiana and at Cornell University. On completion of his work at Cornell Mr. Kretz was commissioned an engineering officer in the United States Navy with the rank of ensign and served during the Spanish-American war. At the close of the war he became assistant professor of mechanical engineering at the University of Louisiana, remaining a member of the faculty of that institution until 1906, when he accepted the management of the Baton

C. H. Kretz.

Rouge Electric & Gas Company. In 1910 Mr. Kretz became manager of the Beaumont (Tex.) Traction, remaining with that company until 1914, when he accepted his present position with the Okmulgee Ice & Light Company.

MR. ERNEST GONZENBACH has announced his resignation as manager of the Empire United Railways, Syracuse, N. Y., and is preparing to establish a business enterprise in that city. Mr. Gonzenbach was formerly president of the Sheboygan (Wis.) Railway & Electric Company.

MR. A. E. DeMERRITT, representing the Philadelphia Utilities Bureau, has been in Lexington, Ky., where he is making a survey of the electric lighting and power situation, including the plant and books of the Lexington Public Utilities Company, preparatory to a report in connection with the proposed new franchise of the company.

MR. F. H. RICKEMAN, formerly manager of the Interstate Light & Power Company, Galena, Ill., has been appointed sales manager, in which capacity he will have charge of the rapidly increasing demands of the Illinois-Wisconsin zinc mining fields. He has been succeeded as manager by MR. W. L. MILLER, formerly superintendent of construction and distribution of the Northern States Power Company.

MR. H. E. DAWSON recently accepted the position of contract agent for the Metropolitan Electric Company, Reading, Pa. For the past five years Mr. Dawson has been with the Edison Lamp Works of General Electric Company, Harrison, N. J., in advertising and general campaign work.

MR. O. F. ABRAHAMSON, formerly with the Indiana Electric Lighting Company, Columbus, Ind., was recently appointed commercial manager of the Interstate Public Service Company, Indianapolis, Ind. Mr. Abrahamson is a graduate of Armour Institute of Technology and was one of the first graduates of the Chicago Central Station Institute.

MR. JAMES A. GREEN has been appointed vice-president and general manager of the Northern Idaho & Montana Power Company and in this capacity will co-operate with MR. ELMER DOVER, vice-president of H. M. Byllesby & Company, in charge of Pacific Coast properties, and president of the Northern Idaho & Montana Power and Oregon Power companies, in the operation of the Byllesby properties in Montana, Idaho, Oregon and Washington.

MR. J. L. WHITE, formerly manager of the Albany (Ore.) division of the Oregon Power Company, has been appointed superintendent of the Willamette Valley division of the Oregon Power Company comprising the cities of Eugene, Springfield, Albany, Corvallis, Dallas and other communities, and in this capacity will assist MR. ATTILLA NORMAN, vice-president and general manager of the Oregon Power Company, whose duties have been extended to include the Coos Bay (Marshfield) division.

MR. JOHN BAUER, who is connected with the bureau of statistics and accounts of the Public Service Commission for the First District of New York, has been chosen head of the new department in accounting, corporation finance and public utilities at Princeton University. Before joining the bureau in 1914, Mr. Bauer had charge of the department of accounting and elementary economics at Cornell University and acted in a consulting capacity in general accounting, rate and capitalization cases. He will not assume his new position until September, remaining with the commission during most of the intervening time.

MR. THEODORE N. VAIL, president of the American Telephone & Telegraph Company, was one of the distinguished visitors in Chicago during the Republican National Convention, June 7 to 10. Mr. Vail was a delegate from Vermont and was active in all of the meetings. During the week local newspapers published interviews with Mr. Vail and he was the guest of honor at numerous social events during his stay. Other prominent electrical men in attendance at the convention were Newcomb Carlton, vice-president of the Western Union Telegraph Company, and C. C. Adams, vice-president of the Postal Telegraph Company, and N. C. Kingsbury, vice-president of the American Telephone & Telegraph Company.

DR. R. C. MACLAURIN, president of the Massachusetts Institute of Technology, was greatly instrumental in financing the construction of the new Institute buildings described on other pages of this issue. Dr. Maclaurin secured gifts of approximately $9,000,000, and at the same time he carried forward the regular work of the institution. He is a native of Edinburgh, Scotland, and is about 46 years of age. His early boyhood was spent in New Zealand, whence he returned to England for his education. He took the degrees of A. B. and A. M. at Cambridge and on graduation was elected a fellow of St. John's College. Dr. Maclaurin came to this country in 1896 and after studying our educational institutions for a year, accepted the professor-

R. C. Maclaurin.

ship of mathematics in the University of New Zealand, became a trustee and was dean of the law faculty for four years. In 1907 he came to Columbia University as professor of mathematical physics, and a year later was made head of the department. In November, 1908, he was appointed president of the Massachusetts Institute of Technology. Dr. Maclaurin's work for that institution is splendidly exemplified by its magnificent plant.

MR. ROBERT MONTGOMERY, manager of the commercial department of the Louisville Gas & Electric Company, has been elected president of the Advertising Club of Louisville, Ky.

MR. J. C. HUTCHINS, president of the Detroit United Railways Company since 1902, has resigned, and has been made chairman of the board, a newly created position. MR. FRANK W. BROOKS, vice-president and general manager of the company, has been elected president and general manager. Mr. Hutchins stated that his retirement as executive head of the company was brought about by his desire to have a rest.

OBITUARY.

MR. JAMES H. GREEN, who was employed by the Holmes Electric Protective Company for over 50 years, died June 5 at his home in Brooklyn, N. Y., aged 75 years.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

WESTFIELD, ME.—The Westfield Electric Company has been incorporated with a capital stock of $10,000 to construct and operate an electric light and power plant. The incorporators are R. J. Colbath and H. A. Anderson of Mars Hill, Me., and A. C. Frost, of Limestone, Me.

PORTSMOUTH, N. H.—The Rockingham County Light & Power Company, operating an electric-lighting plant in this city and furnishing electricity to various street railway lines in the vicinity, has been authorized by the Public Service Commission to issue $750,000 of negotiable gold bonds secured by a mortgage.

ST. ALBANS, VT.—The Public Electric Light Company proposes to extend its lines to Cambridge, Jefferson and Milton, to provide energy for street lighting and commercial service. A 16,000-volt line is proposed.

MONTPELIER, VT.—Articles of association have been filed creating the Arlington Light & Power Company with a capital stock of $50,000. The proposed corporation is seeking a charter to manufacture and distribute electricity in the towns of Arlington, Sunderland and Sandgate. Otto C. F. Kinum, Schnectady, N. Y., and local men are the subscribers.

RUTLAND, VT.—The Vermont Public Utilities Corporation has purchased the holdings of Ryegate (Vt.) Light & Power Company.

AYER, MASS.—The Ayer Electric Company is negotiating with the town authorities with a view to an enhanced street-lighting scheme.

BOSTON, MASS.—The Boston Edison Company is planning a new generating station near the present L Street station. The first unit will be a 30,000-kilovolt-ampere General Electric turbogenerator, 14,000 volts, and running at 1,800 revolutions per minute. Excitation will be at 250 volts. This will be the first generator installed by the Edison Company for 14,000 volts and it will be its first horizontal machine. Four 1,230-horsepower Babcock & Wilcox cross-drum boilers, designed for 350 pounds working pressure, will be installed in connection. The plant is expected to be ready for operation in the fall of 1917.

BOSTON, MASS.—The Metropolitan Water & Sewerage Board of Boston, which operates a hydroelectric station at the Wachusett dam where the runoff is utilized to produce electrical energy which hitherto has been sold to the Connecticut River Transmission Company, proposes to construct a transmission line to connect this plant with another generating station at the Ludbury dam, which is nearing completion. The distance is 15.5 miles and the plan is to construct a two-circuit underground cable line 700 feet from the Wachusett station and a one-circuit overhead line on expanded steel truss poles the remainder of the distance. The estimated cost is $60,000. The object of the connection is to increase the reliability of the service and to enable energy to be delivered from either station, as most desirable.

GREENFIELD, MASS.—The Greenfield Electric Light & Power Company has asked the Massachusetts lighting commission's approval of consolidation with the Deerfield River Electric Light Company of Conway, and for approval of an issue of 5,000 shares of employees' stock at $10 per share.

LUDLOW, MASS.—The Ludlow Electric Light Company has been granted permission to extend its transmission lines from North Street to East Street. Permission is asked from the Town Board for the erection of a transmission line in Center Street about three miles long.

MANCHESTER, MASS.—Plans are being made here for extensions to the whiteway system on Main Street and there is a possibility that the system will be made to include other business streets.

NEWBURYPORT, MASS.—The Massachusetts Gas and Electric Light Company has approved the issue of 570 shares of new stock, at $130, by the Newburyport Gas & Electric Company, the proceeds to pay for extension of lines into West Newbury and construction begun on the company's new generating station.

NEW IPSWICH, MASS.—City officials are considering a contract with the Derry Electric Lighting Company providing for an electric street-lighting system.

WORCESTER, MASS.—Extensions of the newly improved street-lighting system were recommended by the City Council committee on street lighting. Fourteen luminous arc units are proposed.

NEW BRIGHTON, N. Y.—The Richmond Light & Railroad Company is installing in its power house at Livingston, Staten Island, a 6,000-kilowatt Westinghouse unit, including steam turbine, generators, condenser and pump equipment. The new generator will be air cooled by means of an air washer and pump outfit manufactured by the American Spray Company, 201 Devonshire Street, Boston, Mass., which will have a capacity of 37,000 cubic feet of air per minute.

OGDENSBURG, N. Y.—The St. Lawrence Transmission Company is building a new line at DeKalb Junction to a point near Estella mine in Hermon. DeKalb Junction will be given a 24-hour service. The new line will be connected with the main line from Hannawa Falls.

PERRY, N. Y.—The Perry Electric Company has purchased a site near Federal Street on which a new boiler house will be erected this summer. Plant improvements are also being considered. The plant supplies electrical energy for light and power to Perry, Warsaw, Gainesville and Castle.

PORT JERVIS, N. Y.—The question of the proposed consolidation with the Port Jervis Light & Power Company, the Orange County Lighting Company and the Orange County Power Company is being considered by officials of the three companies. It is expected that there will be a hearing before the Public Service Commission shortly regarding the consolidation, which probably will be effected.

RANSOMVILLE, N. Y.—The Lewiston & Lake Ontario Shore Power Company is constructing a transmission line into this city and will furnish energy for power and lighting.

ROCHESTER, N. Y.—The Rochester Railway & Light Company is installing a new underground conduit system in Atlantic Avenue between University Avenue and Culver Road. It will be necessary to install the conduit through rock for a distance of about 1,000 feet.

WOLCOTT, N. Y.—The Northern Wayne Electric Light & Power Company has made a proposition to install a new lighting system here which will include a number of ornamental standards.

BAYONNE, N. J.—The City Commissioners have signified their intention of awarding a new five-year electric-lighting contract to the Public Service Electric Company. The company agrees to install a new street-lighting system to form a white way along Broadway, and to expend $25,000 during the coming year in replacing its overhead lines with an underground system, and $10,000 a year for ten years following in extensions to this work.

IRVINGTON, N. J.—The Irvington Improvement Association is renewing its former discussions to bring about the installation of a municipal electric-lighting plant.

JERSEY CITY, N. J.—The Board of City Commissioners will install new electrical fixtures at its high service pumping station. Bids for equipment will be called for immediately. Michael I. Fagen is city clerk.

MORRISTOWN, N. J.—The Morris County Traction Company will build a new transformer station at Kenvil, and a new transmission line leading from the plant will be constructed.

PENNSVILLE, N. J.—The Salem-Pennsgrove Traction Company will build a new power plant. Stern & Silverman are the engineers.

BEAVER FALLS, PA.—The Petersville Electric Company has been incorporated to operate in Conoquenessing Borough with a capital of $5,000 by W. S. Craig, J. D. Perrott and others, of Pittsburgh. The company's office will be in this city.

EDDYSTONE, PA.—The Chester and Eddystone Street Railway Company has been granted a charter to operate an electric railway between Eddystone and Chester.

FALMOUTH, PA.—The York Haven Power Company will install a new street-lighting system here.

FRANKLIN, PA.—The French Creek Township Power Company and the Sandusky Creek Township Power Company have been incorporated to operate in the townships of those names with a capital of $5,000 each by J. B. Brooks, M. C. Cornell and Joseph McCormick, of Erie. Offices for the companies will be maintained in this city.

MONTGOMERY, PA.—The local electric-lighting plant was damaged recently when the engine flywheel flew apart. New machinery will be installed as soon as possible.

PHILADELPHIA, PA.—The Atlantic Refining Company will erect a power house at 3144 Passyunk Avenue, to cost about $5,000.

PHILADELPHIA, PA.—The Philadelphia Electric Company is having plans prepared by John T. Windrim for a seven-story office building to be erected at 1004 Chestnut Street adjoining its main office building.

SHEPHERDSTOWN, PA.—The Shepherdstown Light & Water Company has been incorporated with a capital of $40,000 to install and operate electric-lighting and water systems.

WASHINGTON, D. C.—Immediate developments of the water power site at Great Falls on the Potomac River to provide electrical energy for Washington is urged in a report submitted by a committee of the Chamber of Commerce. The committee recommends that a proposal be made to Congress authorizing an investigation of the project.

GAFFNEY, S. C.—A representative of the Southern Power Company has been engaged in securing right of way for the purpose of bringing the company's lines into Gaffney. A site for a substation and right of way from Gaffney to Rutherfordton, N. C., has been secured. The transmission line will be erected by way of Forest City, Caroleen and Rutherfordton and will furnish the mills at those places with electrical energy for power and lighting. The Electric Manufacturing & Power Company at Gaston Shoals on Broad River has been furnishing power to Gaffney for several years and the Southern Power Company's plant is located at the Ninety Nine Islands on Broad River, but several miles farther from Gaffney.

NORTH CENTRAL STATES.

COLUMBUS, O.—The Columbus Railway, Power & Light Company has announced that it will abandon its site for a new power station on the Scioto River, just north of West Broad Street, in view of the fact that the Chamber of Commerce has requested this step, in order that a plan to protect the city from floods may be carried out. The company will probably select another site.

LORAIN, O.—Construction work on a large power plant for the National Tube Company in this city has been commenced. The plant will be equipped with gas engines which will be supplied with gas from coke ovens now under construction.

MADISON, IND.—The iron smokestack of the Madison Light & Railway Company's powerhouse, being replaced by a concrete stack, recently collapsed during building operations.

ALVIN, ILL.—The Alvin Grain & Electric Company has been incorporated with

a capital of $10,000 by F. M. Yeazel and others and will install and operate an electric-lighting plant here.

CALEDONIA, ILL.—The Illinois Northern Utilities Company is considering an extension of its transmission lines to furnish electric service here.

LITCHFIELD, ILL.—Preparations are being made to rebuild the interlocking plant of the C., C., C. & St. L. Railway in this city. The present switching tower may be replaced by a new one.

WARREN, ILL.—The Warren Light & Power Company has been granted permission by the State Public Utilities Commission to issue $10,500 in notes.

HOWARD CITY, MICH.—The Universal Power Company has filed articles of incorporation and is organized to manufacture gas and develop power facilities in Montcalm and Mecosta Counties. Howard City and Morley are to be the principal cities benefited. The capitalization is $60,000 and J. M. Donahue, George Arnold and G. M. Doty are the incorporators.

MADISON, WIS.—The Capital Interurban Company of Madison has been organized to construct an electric railway from Madison to Janesville, a distance of 42 miles. The capital stock is $10,000, and the incorporators are Gustave Pickhardt, of Milwaukee; E. C. Smith, of Madison, and others.

ODANAH, WIS.—A. E. Appleyard, of Ashland, has purchased the franchises issued to D. U. Parkinson for installing telephone and electric-lighting systems here and will proceed with the erection of the plants.

BEMIDJI, MINN.—An election will be held soon to vote on the question of establishing a white-way system here.

CALEDONIA, MINN.—Plans are being made for the extension of the Root River Lighting & Power system from Spring Grove to this city.

MINNEAPOLIS, MINN.—It is reported that the Minneapolis General Electric Company is preparing plans for a substation at 930 Hennepin Avenue, to cost approximately $7,000.

SAUK CENTER, MINN.—The Minnesota Light & Power Company, of St. Cloud, has recured an option on the plant of the Central Minnesota Power & Milling Company, of this city, according to reports.

WABASHA, MINN.—The Wisconsin-Minnesota Light & Power Company, of Eau Claire, Wis., has commenced the construction of a transmission line to this place.

ANTHON, IOWA.—Bonds in the sum of $20,000 have been voted for the establishment of a municipal electric-lighting plant.

ELVINS, MO.—The Missouri Public Utilities Company, of Cape Girardeau, has been granted a franchise to install and operate an electric-lighting plant here.

MARSHALL, MO.—At an election to be held June 26 a bond issue of $75,000 will be voted on. If the issue is authorized the proceeds will be used to erect an electric-lighting plant or to purchase the present plant.

MT. VERNON, MO.—C. A. Moore, engineer, Frisco Building, Joplin, Mo., is preparing plans for improvements to the electric-lighting and waterworks systems.

SPRINGFIELD, MO.—The St. Louis & San Francisco Railroad Company, which has generating plants at both its south side shops and its new shops, has contracted with the Springfield Gas & Electric Company to supply all the energy to be used at its Springfield shops, stations and offices. A month ago the railroad began purchasing energy for mill and boiler shops at its new location, and the latest contract includes the other shops.

ALMENA, KANS.—The local electric-lighting plant was recently destroyed by fire. Plans are being made to rebuild.

HERINGTON, KANS.—Plans are under way for the installation of a white-way system in the business district here.

HESSTON, KANS.—The Commercial Club is devising ways and means to secure an electric-lighting system here.

HUTCHINSON, KANS.—Materials for the new transmission line to be built by the United Water, Gas & Electric Company northeast through Inman and Medora have been ordered and work on the erection of the line will soon be commenced.

MOUNDRIDGE, KANS.—City officials are considering plans for establishing a street-lighting system here.

WILLOWDALE, KANS.—Weiser & Albers are planning to install electric-lighting and ice plants here.

CAVOUR, S. D.—The Commercial Club is considering ways and means for the installation of a municipal electric-lighting plant.

DATES AHEAD.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer *Arizona*, June 18-22. Secretary, Herbert Silvester, Rochester, Mich.

Tri-State Water and Light Association. Annual convention, Isle of Palms, S. C., June 21-23. Secretary, W. F. Stieglitz, Columbia, S. C.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Cleveland, O., June 22-23. Secretary, F. E. Sanborn, Ohio State University, Columbus, O.

Electrical Contractors' Association of Pennsylvania. Annual convention, Wilkes-Barre, Pa., June 21-22. Secretary, M. G. Sellers, 1518 Sansom Street, Philadelphia, Pa.

American Institute of Electrical Engineers. Annual convention, Hollenden Hotel, Cleveland, O., June 27-30. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 5-8. Secretary, H. N. Muller, Duquesne Light Company, Pittsburgh, Pa.

Illuminating Engineering Society. Annual convention, Philadelphia, Pa., September 18-21. Secretary, C. A. Littlefield, Irving Place and Fifteenth Street, New York City.

Association of Iron and Steel Electrical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

WOONSOCKET, S. D.—Plans are being made to install an ornamental lighting system in the business district.

ANAMOOSE, N. D.—N. J. Walper, owner of the local electric lighting plant, is preparing to make a number of plant extensions. Additional generating equipment has been ordered and 24-hour service will be given.

CLEVELAND, N. D.—Ways and means for securing an electric-lighting system for this city are being considered.

LANKIN, N. D.—An election will soon be held to determine the question of issuing bonds for the installation of a municipal electric-lighting plant.

NECHE, N. D.—Plans are being considered here for the installation of an electric-lighting plant. Alex Rabowski, of Cherokee, Iowa, is preparing to install the plant.

SOUTH CENTRAL STATES.

LEXINGTON, KY.—The new franchise drafted for the city by the Utilities Bureau, of Philadelphia, has been received and will be offered to the Lexington Utilities Company after it has been submitted to the city administration. The present franchise expires on August 10. A proposed franchise submitted two years ago to the people was defeated at a referendum.

MARION, KY.—Pending dissolution of the Marion Light & Ice Company is announced by S. M. Jenkins, president.

OWENSBORO, KY.—The Kentucky Electrical Company is asking for prices on a milling machine, a 24-inch lathe and a small four-spindle drill press.

PROVIDENCE, KY.—Members of the local Board of Public Works have resigned their offices, leaving construction of the municipal lighting plant under the supervision of Judge J. M. Reynolds.

DANDRIDGE, TENN.—The Dandridge Power & Light Company is again furnishing service to the city and is preparing to make a number of plant extensions.

JONESBORO, TENN.—The Jonesboro Supply House is in the market for used motors with a capacity of one or two horsepower.

KNOXVILLE, TENN.—The city has awarded to the Knoxville Railway & Light Company, at $9,000, the contract for installing the white-way system in the business district.

MEMPHIS, TENN.—A. B. Amos, of Little Rock, Ark., president of the Askansas Hydroelectric Development Company, is in this city to study the problem of transmitting electrical energy to Memphis and West Memphis. His company has undertaken the development of a water power site on the Little Red River and it is expected that enough power will be developed sufficient for supplying a number of municipalities near Little Rock.

JASPER, ALA.—The holdings of the Jasper Water, Light & Power Company have been purchased by the Alabama Power Company. The latter company will erect a transmission line from Magella to this city and energy will be supplied from the company's main transmission system.

MAGNOLIA, MISS.—The plant of the Magnolia Electric Light Company has been purchased by the McComb, Magnolia Light & Railway Company. The latter company is obtaining right of way for a suburban line which will connect Magnolia, Fernwood, McComb and Summit.

MONROE, LA.—Plans are being prepared by W. G. Kirkpatrick, engineer, Jackson, Miss., for rebuilding the electric-lighting plant here.

NEW WILSON, OKLA.—The city recently rejected all bids submitted for the construction of electric-lighting and water plants. Plans and specifications were prepared by the Benham Engineering Company, Oklahoma City, and included all equipment. Bids will be advertised for again.

TULSA, OKLA.—The Tulsa Interurban Railroad Company has financed its proposed interurban electric railway that is to be built between Tulsa and Wagoner, according to H. D. Pattee, the promoter of the project. The line will be 37 miles long and will run via Broken Arrow. The project involves the construction of an electric power station.

EL PASO, TEX.—Materials have been assembled at Fort Bliss for the erection of a radio station which will have a power plant of sufficient capacity to make communication with all border signal service camps.

MARBLE FALLS, TEX.—The National Hydro-Electric & Construction Company, which began the construction of a dam across the Colorado River at this place several years ago as a preliminary step towards the building of a large hydro-electric plant, has succeeded in financing the project and will carry it to early completion, according to the announcement of C. H. Alexander, of Dallas, president of the company. Mr. Alexander is negotiating with the City Commission of San Antonio with the view of furnishing that city with 20,000 horsepower. High-tension transmission lines will also be built to other cities and towns in this part of the state.

SAN BENITO, TEX.—The San Benito & Rio Grande Railroad is to be extended from its present terminus at Los Indios to Harlingen.

SAN ANTONIO, TEX.—The Houston, Richmond & Western Traction Company is placing contracts for materials for the construction of its proposed interurban electric railway that is to run between San Antonio and Houston. The contract for the construction of the electric power station will be awarded soon, it is announced. Captain Ed Kennedy is president.

SOUR LAKE, TEX.—The Sour Lake Ice, Light & Power Company has been incorporated with a capital of $50,000 by F. H. Carpenter, A. H. Tarver and T. F. Cruse.

WESTERN STATES.

BUTTE, MONT.—Articles of incorporation have been filed by the Montana Power Construction Company, naming capitalization of $50,000 and incorporators as Henry F. Kroyer, Stephen P. Hogan and M. E. Buck. Butte is given as principal place of business, and company announces intentions of constructing dams, reservoir and canals for the generation, storage and transmission of gas and electricity.

HYSHAM, MONT.—Bonds have been voted for the establishment of electric-lighting and water systems in this city and bids have been submitted by several contractors.

LEWISTOWN, MONT.—It is reported that the Montana Power Company plans the extension of its power transmission lines to Judith Gap and nearby territory. The plan has for its object the construction of a circle of power lines from Lewistown to Moore, to Judith Gap, to Harlowton and thence to Twodot.

AULT, COLO.—An electric-lighting system will be installed here if the plans of G. H. Sethman, of Denver, are approved by the Town Board.

PUEBLO, COLO.—The Arkansas Valley Railway, Light & Power Company has ordered a 1,500-kilowatt frequency changer for installation in its power plant here. Transmission line poles between Crowley and Manzanola have been set and construction work is being done on the line to Olney Creek, after which the work of building a new line from Holbrook to Cheraw will be commenced.

ALAMOGORDO, N. M.—The formal transfer of the properties of the Alamogordo Light, Power & Water Works Company to the town of Alamogordo for a total consideration of $300,000 has just taken place. Improvements will be made to the electric-lighting and waterworks plant.

GLOBE, ARIZ.—The Globe Light & Power Company is preparing to add another complete generating unit to its electric light and power plant.

BOISE, IDAHO.—The American Smelting & Refining Company, which recently purchased the North Star and Triumph group of mines, has signified its intention of having a power line constructed from Hailey to the mines in order to use electricity in their operation.

COEUR D'ALENE, IDAHO.—The Washington Water Power Company has closed a contract with William Shannon, manager of the Four Timbers Mining Company, for the extension of its transmission lines to the mine.

COEUR D'ALENE, IDAHO.—The City Council recently passed an ordinance providing for an election to determine whether $280,000 in bonds will be issued for a municipal light and water plant, and A. Cook, manager of the Panhandle Abstract Company, has applied to the Supreme Court for an alternative writ of prohibition, asking the City Council to refrain from putting into effect the ordinance. The Consumers Company, which now supplies the city, offered to sell the local utilities, but the proposal was declined.

POCATELLO, IDAHO.—The City Council has created improvement district No. 15, which includes practically all the business and residential districts of the city, and has planned to install a new lighting system. A large number of ornamental standards is proposed. The estimated cost of the improvements is over $70,000.

POMEROY, WASH.—The Civic Improvement Club has agreed to contribute $700 toward the installation of cluster lights on Main Street, the cost of which would be about $1,800.

SPOKANE, WASH.—The establishment of a power plant is contemplated by the introduction in the Senate of a bill authorizing the Secretary of War to grant John D. Sherwood, of this city, the right to overflow certain lands in the Fort George Wright military reservation.

TACOMA, WASH.—The Tacoma Railway & Power Company has applied to the County Commissioners for a franchise to erect a power line along Lincoln Avenue on the tide flats.

HOMESTEAD, ORE.—It is reported that the Idaho-Oregon Power Company plans the construction of transmission lines to the Irondyke and Homestead mines to supply energy for the operation of electrical equipment which will be installed.

PORTLAND, ORE.—Bids for the installation of electric wiring and fixtures in the new auditorium under construction will be received by A. L. Barbur, City Auditor, at an early date. Plans for the installations are being prepared by Whitehouse & Fouilhoux, architects, Wilcox Building, Portland.

RIDDLE, ORE.—A. E. Erais has filed his formal acceptance of the franchise for establishing in Riddle an electric light and power system, and actual construction work will commence shortly.

BAKERSFIELD, CAL.—Lighting Expert Dickinson has submitted plans for the proposed electrolier system covering the downtown business district. His plans call for 149 lighting standards, and he estimates the total cost of installation at $28,310.

BERKELEY, CAL.—The Regents of the University of California have taken under advisement bids for furnishing and installing lighting fixtures in the library building on the campus. The bids ranged from $17,446 to $29,933 on one proposition, and from $11,653 to $17,546 on the other proposition.

FULLERTON, CAL.—Surveyors are mapping out right of way for the proposed extension of the Pacific Electric Railway from Brea to Fullerton.

QUINCY, CAL.—The Great Western Power Company is said to have purchased the reservoir site, ditches and water rights of the Oro Electric Corporation in Humbug Valley and along Yellow Creek to the north fork of the Feather River, where the Oro company had acquired a site for a power plant. It is understood the property will be used by the Great Western in the development of a series of power plants, the ultimate construction cost of which will be approximately $25,000,000, according to officials of the company.

LOS ANGELES, CAL.—The Board of Public Works is taking bids for lighting the East Hollywood District from July 1 to December 31, 1916.

LOS ANGELES, CAL.—The City Attorney has been authorized to institute proceedings in the Superior Court to acquire by condemnation a right of way over certain property for the purpose of constructing an electrical transmission line from a point in Inyo County to a point in Los Angeles County.

OAKDALE, CAL.—The Sierra & San Francisco Power Company suffered a loss estimated at $20,000 in a recent fire at its plant at the new Strawberry dam.

TULARE, CAL.—The Merchants Association has submitted a proposition to the property owners in the business district to install an electrolier system at a cost of 27 cents a front foot, the merchants to furnish the energy.

VENTURA, CAL.—Work is to begin shortly on the construction of two new substations here for the Ventura Light & Power Company.

Proposals

SIGNAL SUPPLIES.—Sealed proposals will be received at the office of the Chief Signal Officer, United States Army, Washington, D. C., until June 23, for furnishing metal T. I. bell boxes, transfer switch boxes, covers for pit firing signal box, T. I. switch panels, zone signal bells, etc.

LIGHTING FIXTURES.—Sealed proposals will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., at 3 p. m., June 28, 1916, for furnishing and installing lighting fixtures in the United States post office, custom house, and court house at Hilo, Hawaii. See proposal columns for details.

ELECTRICAL SUPPLIES.—Bids will be received until July 12 by the village of Keewatin, Minn., for the following material: Ten 14-foot cast-iron standards, 2,400 feet of 1.25-inch iron conduit, 34 90-degree bends, and 12 couplings; 2,400 feet of No. 6 lead-covered cable, tested at 5,000 volts; and 10 Lundin cutouts. C. W. Extrum, village clerk.

ELECTRICAL CONSTRUCTION.—Separate bids will be received until June 26 by G. W. Orr, secretary of the board of education, Lake Linden, Mich., for the electrical work, telephone system, and clock and signal system for a new high school at Lake Linden. Plans and specifications may be secured from J. D. Chubb, architect, 109 North Dearborn Street, Chicago, Ill.

LIGHTING SYSTEM.—Sealed proposals will be received June 30 for furnishing the necessary labor and material for a complete new lighting system for the streets, alleys, public buildings and public places at Washington, O., and to consist of approximately 41 100-candlepower bracket or center-suspension lamps and 36 250-candlepower bracket or center-suspension lamps with refractors. James J. Flynn, Clerk of the Board of Service-Safety Directors, Washington, O.

ELECTRIC ELEVATOR.—Sealed proposals will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., at 3 p. m., July 5, for the installation complete of a new electric passenger elevator, including certain alterations, in the United States post office, courthouse, etc., at Troy, N. Y., in accordance with the drawing and specification, copies of which may be had at that office in the discretion of the Supervising Architect. James A. Wetmore, Acting Supervising Architect.

PANAMA CANAL SUPPLIES.—Sealed proposals will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until June 28, for furnishing, by steamer free of all charges, on dock at either Colon (Atlantic port) or Port of Ancon (Balboa, Canal Zone) (Pacific port), Isthmus of Panama, cast-iron lamp posts, base sockets, porcelain receptacles, transformers, panelboards, lighting fixtures, electrical attachments, conduit and fittings, electric cable wire, insulating tape, pipe-bending machines, cable-reel wheels, etc. Information regarding this circular (No. 1049) can be obtained at the above office or at offices of assistant purchasing agents: 24 State Street, New York City; Fort Mason, San Francisco, Cal., and 614 Whitney Building, New Orleans, La.

Financial Notes

The Eastern Oregon Light & Power Company, of Baker, Ore., has decreased its capital stock to $1,843,500.

Edison Electric Company, of Los Angeles, a subsidiary of Southern California Edison Company, has called for redemption September 1, $100,000 of its first and refunding bonds at 110 and interest.

The Massachusetts Gas and Electric Light Commission has approved an issue of 11,800 shares of common and 10,000 shares of $10 employees' stock by the Turners Falls Power & Electric Company.

It has been reported that the United Railroads of San Francisco is to shortly petition the California Railroad Commission for sanction to another bond issue by which all the bond issues will be gathered up in one mortgage.

The May gross earnings of Edison Company of Boston, were $657,660, an increase of $81,720, or 14.19 per cent over the corresponding month a year ago. In eleven months ended May 31, gross earnings were $7,667,090, an increase of $797,257, or 11.61 per cent over the same period last year.

Union Light, Heat & Power Company has called for payment, at 105, on September 1, through the State Bank, of Chicago, all its outstanding first-mortgage five-per-cent bonds due September 1, 1932. The company is a subsidiary of the Northern States Power Company of Minnesota, and the calling of the bonds is a part of the plan for consolidating the funded debts of all subsidiaries of the Northern States Power organization.

The California Railroad Commission has issued an order authorizing the Corona (Cal.) Gas & Electric Company to execute a mortgage on its properties as security for an issue of $58,500 six-per-cent 50-year bonds, and to issue these bonds. The proceeds from the sale are to reimburse the company for expenditures for additions and betterments, $33,339; to liquidate indebtedness owing the Nevada-California Power Company, $18,850; and to the Southern Sierras Power Company, $422.

The Santa Barbara (Cal.) Gas & Electric Company has been authorized by the Railroad Commission to issue $1,000,000 face

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 12.	June 5.
American Tel. and Tel. (New York)	129⅞	129½
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	238	238
Electric Storage Battery common (Philadelphia)	65	64½
Electric Storage Battery preferred (Philadelphia)	65	64½
General Electric (New York)	171½	169½
Kings County Electric (New York)	130	130
Massachusetts Electric common (Boston)	6	6
Massachusetts Electric preferred (Boston)	34½	34
National Carbon common (Chicago)	170	170
National Carbon preferred (Chicago)	123	122
New England Telephone (Boston)	134½	134
Philadelphia Electric (Philadelphia)	27½	27⅞
Postal Telegraph and Cables common (New York)	81	80½
Postal Telegraph and Cables preferred (New York)	68¼	68
Western Union (New York)	94	94⅝
Westinghouse common (New York)	61¾	61¼
Westinghouse preferred (New York)	73	70

value five-per-cent first-mortgage bonds, at not less than 91, under a deed of trust to the Los Angeles Trust & Savings Bank. Of the bonds, $210,000 will mature serially at the rate of $10,000 a year from 1920 to 1940 and the remainder in 1941. From the proceeds of the sale, $884,625 is to be expended to retire the company's outstanding issue of $824,500 of bonds at 105, and $25,375 to reimburse the company for capital expenditures made from income.

Narragansett Electric Lighting Company, of Providence, has purchased from Bodell & Company the controlling interest in the Westerly Light & Power Company, the latter firm having been in control of the Westerly property since 1912. The Narragansett company paid $95 a share for the stock and the same price is offered minority stockholders for a limited period. By the acquisition of the Westerly company Narragansett Lighting obtains control of the entire electric lighting and power situation south of Providence in Rhode Island and in southeastern Connecticut. The company pays dividends at the rate of five per cent on both its preferred and common stocks.

American Railways Company, controlled by National Properties Company, has advised the Public Utility Commission of New Jersey that it has acquired, subject to the approval of the commission, all the capital stocks of the Electric Company of New Jersey, the Penns Grove Electric Light, Heat & Power Company, the Woodstown Ice & Cold Storage Company, the Clementon Township United Electric Improvement Company and the Williamstown Electric Company. All the stocks of the companies are now under contract to purchase and in case approval is granted for their acquisition the companies will be consolidated, and the capital stock of the new company held by American Railways Company.

Dividends.

	Term.	Rate.	Payable.
Am. Pub. Utilities	Q	1.5 %	July 1
Buffalo Gen. Elec., com.	Q	1.5 %	June 30
Cal. Ry. & Pw., prior pf.	Q	1.75%	July 1
Cent. States Elec. Corp., pf.	Q	1.75%	July 1
Col. Elec., pf.	S	$3.00	July 1
Col. Ry., Pw. & Lt., Series A	Q	1.5 %	July 1
Col. Ry., Pw. & Lt., prior pf.	Q	1 %	July 1
Consum. Elec. Lt. & Pw., pf.	Q	1.75%	June 30
Dayton Pw. & Lt., pf.	Q	1.5 %	July 15
Duluth-Sup. Trac., pf.	Q	1 %	July 1
Eastern Pw. & Lt. Corp., pf.	Q	1.75%	June 15
Eastern Tex. Elec., pf.	S	$3.00	July 1
Eastern Tex. Elec., com.—		$2.00	July 1
Elec. Lt. & Pw. of Abington and Rockland	S	$4.00	July 1
Elec. Stor. Batt., pf.	Q	1 %	July 1
Elec. Stor. Batt., com.	Q	1 %	July 1
Elec. Secur. Corp., pf.	Q	1.5 %	Aug. 1
Elec. Secur. Corp., com.	Q	2 %	July 1
Ill. Traction, pf.	Q	1.5 %	July 1
Inter. Rap. Tran.	Q	5 %	July 1
Montreal Lt., Ht. & Pw.	Q	2.5 %	Aug. 15
Niagara Falls Pw.	Q	$2.00	July 15
No. Ont. Lt. & Pw., pf.	S	3 %	July 15
Springfield Ry. & Lt., pf.	Q	1.75%	July 1
United Trac. & Elec.	Q	1.25%	July 1

Reports of Earnings.

J. G. WHITE COMPANIES.

The annual report of the J. G. White Companies, which includes J. G. White & Company, the J. G. White Engineering Corporation and the J. G. White Management Corporation, has been issued. The amalgamated balance sheet of the companies for the fiscal year ending December 31, 1915, is as follows:

Good will, contracts, purchase of business, etc.	$1,515,540.19
Securities owned and syndicate participations	2,512,245.60
Bills receivable	346,560.60
Accounts receivable	475,453.18
Interest and dividends accrued	5,382.42
Deferred charges and sundries	11,876.27
Cash in banks and on hand	543,339.74
Working capital and cash in branch offices	10,621.51
Total assets	5,421,019.51
Common stock issued	1,500,000.00
Preferred stock issued	2,790,900.00
Bills payable	325,000.00
Accounts payable	147,416.32
Sundry stockholders for dividends on preferred stock	53,840.75
Surplus or undivided profits	603,862.44

NEW ORLEANS RAILWAY & LIGHT.

New Orleans Railway & Light Company, a subsidiary of American Cities Company, reports as follows for the three months ended March 31, 1916:

	1916	1915
Gross earnings	$1,835,159	$1,807,061
Net after taxes	724,393	732,947
Balance after miscellaneous deductions and underlying charges	562,225	578,880
Net income after interest on other bonds and notes	261,577	290,478
Surplus after renewal and depreciation reserves	203,474	244,288

Electrical Patents Issued June 6, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,185,630. Motor-Truck. W. C. Carr, assignor to Automatic Transportation Co., Buffalo, N. Y. Mounting and gearing of motor on three-wheel truck.

1,185,635. Automatic Telephone-Exchange System. G. Deakin, assignor to Western Electric Co., New York, N. Y. Selective ringing on party line.

1,185,645. Attachment for Converting Oil Lamps into Electric Lamps. J. H. Faw, assignor to J. H. Faw, Inc., New York, N. Y. Means for securing socket to oil-lamp structure.

1,185,646. Electrical Lamp-Socket and Switch. J. H. Faw, assignor to J. H. Faw, Inc. Details of structure for use with above.

1,185,648. Motor. F. H. Feraud, Granite City, Ill. Pawl and ratchet mechanism actuated by solenoid.

1,185,673. Electrically Heated Utensil. D. C. G. Hughes, Chicago, Ill. Special mounting of heating element in bottom of utensil.

1,185,680. Resonant Amplifying-Receiver. A. G. Keplinger, Kansas City, Kan. For radiotelegraph systems; electromagnetically operated diaphragm in special resonant chamber.

1,185,681. Lathe and Other Machine. H. G. Kienzle, Schwenningen-on-the-Neckar, Germany. Mounting of motor on spindle.

1,185,685. Vapor Electric Apparatus. C. A. Kraus and R. D. Mailey, assignors to A. A. Noyes, trustee, Boston, Mass. Anodes suspended in metal container with mercury in insulated cup at base, and curtain to prevent spattering.

1,185,690. Electric Switch. G. W. Lawrence, Cranford, N. J. Drum controller.

1,185,700. Insulator for Trolley Wires. B. C. Moss, assignor of one-half to C. C. Fritts, Kansas City, Mo. Elliptic spools secured together by side links.

1,185,703. Safety Railway Apparatus. J. L. Murdock, Roundbrook, N. J. Electromagnetic track device for block system.

1,185,711. Receiver for Wireless Telegraphy and Telephony. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., New York, N. Y. Arrangement of inductance, telephone receiver and interrupter.

1,185,712. Isochronizing and Synchronizing System. P. M. Rainey, assignor to Western Electric Co. Method of isochronizing two rotatable members interconnected by a transmission line.

1,185,720. Recording-Target. S. A. M. Rose, Westminster, London, England. Electrically operated.

1,185,724. Shoe-Fitting Display-Stool. C. C. Schlax, Kansas City, Mo. Electrically lighted.

1,185,729. Electric Sad-Iron. N. E. Starr, Township 15, Douglas County, Neb. Resistor in two sections and special connections and switch for connecting one or both.

1,185,734 and 1,185,735. Measuring Instrument. S. Trood, assignor to Westinghouse Electric & Manufacturing Co., E. Pittsburgh, Pa. First patent: steam-flow meter; armature rotated according to velocity of steam and air gap between it and permanent magnet varied according to temperature and pressure. Second patent: liquid resistances controlled by velocity and pressure and resistor controlled by temperature of steam, in circuit of electric meter.

1,185,736. Fluid-Flow Meter. S. Trood, assignor to Westinghouse Electric & Manufacturing Co. Electric meter actuated according to potential of generator operated according to velocity of fluid and controlled in accordance with temperature and pressure.

1,185,738. Electropneumatic Brake. W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Automatically held in applied position for predetermined time.

1,185,740. Combined Vehicle Lamp and Horn. N. B. Wales, assignor to Selaw Products Co., Saginaw, Mich. Electromagnetically operated diaphragm in base of reflector.

1,185,742. Spark-Plug. J. M. Walton, New Orleans, La. Has special provisions for cleaning and oil draining.

1,185,749. Oil-Switch. H. A. Yearick and E. Schreiber, Sunbury, Pa. Details of structure having lever-operated swinging contacts.

1,185,750. Bonding Device for Rails. A. A. Ziegler, Boston, Mass. Clip for bond wires secured by splice bar-bolt.

1,185,787. Shear. E. K. Ford, Detroit, Mich. Release for cutting member electrically controlled by sheet.

1,185,788. Secondary or Storage Battery. B. Ford, Philadelphia, Pa. Means for detachably connecting terminal with cover.

1,185,792. Seat-Indicator. H. J. Hansen, Seattle, Wash., assignor of one-third to H. P. Scheel and W. McArthur, Tenino, Wash. Movement of seats controls signal lights indicating occupancy.

1,185,796. Support for Lighting Fixtures. M. Herskovitz, Chicago, Ill. Ceiling attachment.

1,185,814. Electric Signal. J. F. McElroy, assignor to Consolidated Car Heating Co., Albany, N. Y. Signal lamp in multiple circuits of different resistance, and resistance in series with the branches.

1,185,836. Adjustable Bearing. F. Schneider, assignor to The Van Dorn Electric Tool Co., Cleveland, O. Thrust bearing for portable motor-driven tool.

1,185,839 and 1,185,839. Clamping Mechanism. W. T. Sears, assignor to Niles-Bement-Pond Co., Jersey City, N. J. First patent: cam for clamping rotating column in base operated by solenoid. Second patent: modification having cam holding dog operated by additional solenoid.

1,185,842. System for Controlling Electric Locomotives from a Distant Point. F. L. Sessions, assignor to The Jeffrey Manufacturing Co., a corporation of Ohio. Stationary controller connected with car motor through track and contact shoe engaging third conductor.

1,185,843. Selective Signaling Apparatus. M. Setter, assignor to American Electric Telephone Co., Chicago, Ill. Telephonic switching device actuated by operator's key.

1,185,849. Heater. F. C. Smith, Port Arthur, Tex. Electric heater in chamber at side of fluid pipe.

1,185,851. Electric Switch. O. T. Snyder, assignor to O. T. Snyder & Co., Columbus, O. Push-rod-operated snap-switch.

1,185,866. Photographic - Print-Exposure Apparatus. L. A. Bell, McMechen, W. Va., assignor of one-fourth to W. E. Hicks, McMechen, W. Va. Lamp circuit controlled by door of printing compartment.

1,185,877. Reproducing and Transmitting Apparatus. J. J. Comer, assignor to Automatic Enunciator Co., Chicago, Ill. Unitary structure having microphone on each side of diaphragm.

1,185,878. Telephone Amplifier. J. J. Comer, assignor to Automatic Enunciator Co. Particular connections of microphone with armature of electromagnet.

1,185,879. Telephone System. J. J. Comer, assignor to Automatic Enunciator Co. Circuit arrangements for connecting number of special transmitters to single battery.

1,185,893. Attachment for Electric Flash-Lamps. H. Ennis, Layland, W. Va. Valve-cleaning needle on side of case so that work is illuminated.

1,185,904. Lamp. L. E. Hendricks, Campbellsport, Wis. Apparatus for submerged illumination.

1,185,919. Signaling System. E. H. Long, Oakland, Cal. Details of switching mechanism, etc., for transmitting signals by reversing polarity of transmitted current.

1,185,920. Automatic Train-Stop and Recorder. J. H. K. McCollum, assignor to G. H. Gooderham and J. W. L. Forster, Toronto, Ont., Can. Air valves controlled by track obstruction and current trans-

mitted to car through wheels and obstruction shoe.

1,185,921. Photographic Lighting Apparatus. E. Markley, Cairo, Nebr. Normally lighted electric lamps are put out when flash powder ignited.

1,185,931. Engine-Starter. J. B. Peters, assignor to Electric Auto-Lite Co., Toledo, O. Special electromagnetically controlled connection of motor with engine.

1,185,938. Telephone Exchange. C. L. Redfield, Chicago, Ill. Interconnected, magnetically operated, selecting-switch mechanisms.

1,185,958. Automatic Train-Controlling and Cab Signaling System. R. E. Thompson, Seattle, Wash. Details of block system.

1,185,959. Nickel Anode and Process of Manufacture. J. L. Walsh, assignor to The Prest-O-Lite Co., Inc., Indianapolis, Ind. Process of utilizing scrap anodes in electroplating.

1,185,978. Electric Hand-Lamp. C. F. Burgess, assignor to C. F. Burgess Laboratories, Madison, Wis. Lamp and battery of flashlight may be assembled before placing in case.

1,185,987. Light and Sound Distributing Apparatus. G. E. Emerson, assignor to Emerson Phonograph Co., Inc., New York, N. Y. Sound from phonograph in lamp base carried up through standard and discharged through lamp supporting arms under shade.

1,185,997 and 1,185,998. Indication Means for Light-Signals. C. O. Harrington, assignor to Union Switch & Signal Co., Swissvale, Pa. First patent: excess or deficiency of current in signal lamp circuit indicated in relay circuit connected by transformer. Second patent: lighting of one and extinguishment of other lamp of two-lamp signal indicated in relay circuit.

1,185,999. Indicating Means for Light-Signals. C. S. Snavely, assignor to Union Switch & Signal Co. Lighting of signal lamps indicated by means affected by phase reversals, accomplished by transformers, according to lamps lighted.

1,186,011 and 1,186,012. Alternating-Current Electromagnet. D. L. Lindquist, assignor to Otis Elevator Co., New York, N. Y. First patent: rivet of magnetic material through laminations of core forms closed secondary. Second patent: solid inductive bar inserted in core lamination symmetric to axis of core forms closed secondary.

1,186,016. Elevator. A. Magnuson, assignor to Otis Elevator Co., Jersey City, N. J. Electric cable to car wound on drum on hoist and tension maintained by connection between drum and counterweight.

1,186,023. Gun-Tampion and Means for Actuating the Same. W. V. Moore, New York, N. Y. Solenoid operated; gun electrically fired when tampion removed from muzzle.

1,186,024. Electric Heating System and Thermostatic Control. H. A. Mulvany, Berkeley, Cal. Number of units, each having primary and secondary heating coils, have primary coils controlled collectively and secondary coils individually.

1,186,028. Automatic Headlight Control. F. W. Opp, Santa Ana, Cal. Displacement of headlight lens electromagnetically controlled by steering mechanism of automobile.

1,186,049. Lock for Telephones. J. S. Stephens, Paterson, N. J. For locking receiver hook.

1,186,051. Machine Telephone Switching System. J. N. Wallace, assignor to Western Electric Co. Arrangement of non-numerical automatic switches, etc., for extending calling lines to connecting circuits.

1,186,057. Operator's Cord-Circuit with Reverting Busy-Test. C. S. Winston, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement of circuits, jacks, etc.

1,186,080. Ventilating Attachment for Bowls of Lighting Fixtures. A. Copeland, Chicago, Ill. For semi-indirect lighting; central support has ventillating passages.

1,186,081. Lamp. W. D. Crow, assignor to Hospital Devices Co., Inc., East Orange, N. J. Support reflector, etc., for combination of gas and electric lamps.

1,186,083 and 1,186,084. Primary Battery. E. M. Deems, East Orange, N. J. First patent: Support, insulation and structure of elements. Second patent: Modification.

1,186,090. Fuse-Plug. J. H. Hanson, Chicago, Ill., assignor of one-third to S. H. Loughman and one-third to M. Allan, Chicago, Ill. Structural details.

1,186,106. Electrochemical Apparatus. C. P. Landreth, Philadelphia, Pa. Has means for subdividing solids in liquid and disposing of resulting liquids, etc.

1,186,121. Switch-Plug. W. Murray and F. S. Murray, New York, N. Y. Details of construction.

1,186,122. Electric Signal Device. G. W. Norgate, assignor to Benjamin Electric Manufacturing Co., Chicago, Ill. Bodily movable housing for electromagnet is moved thereby against spring into contact with base.

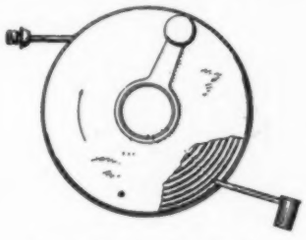
1,186,131. Cord-Reel. D. B. Replogle, assignor of one-third to F. M. Ray, Oakland, Cal. For housing service cord. (See cut.)

1,186,146. Indicator for Electrical Connections. O. C. Sutherland and E. M. McLaughlin, Richmond, Cal. Relatively movable members parts of diagrams, in different relations show different complete diagrams of electrical connections.

1,186,158. Means for Charging Storage Batteries. D. C. Anderson, Sewickley, Pa. Internal heat of battery effects step-by-step variation of charging current.

1,186,165. Reflector-Shade for Lamps. R. B. Benjamin, assignor to Benjamin Electric Manufacturing Co. Constructed to project light downwardly, avoiding bulb and shade.

1,186,197 and 1,186,198. Portable Electric Light. C. Hubert, New York, N. Y. First



No. 1,186,131.—Cord-Reel.

patent: Details of tubular flashlight. Second patent: Has lamp at side of battery casing.

1,186,217. Metal-Coated Iron or Steel Article. C. Mark and C. Mark, Jr., assignors to C. Mark, Chicago, Ill. Coating is electropositive to iron.

1,186,221. Spark-Plug. A. R. Mosler, New York, N. Y. Structure of insulator and mounting in shell.

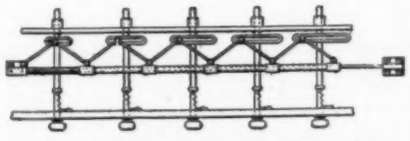
1,186,222. Method of Electrical Welding. T. E. Murray, New York, N. Y. Circular tube produced from two longitudinal sections.

1,186,227. Electromagnet-Mount. J. G. Peterson, assignor to Manhattan Electrical Supply Co., Jersey City, N. J. Details of securing magnet frame to support and insulating it.

1,186,246. Combined Ignition and Radio System. H. R. Van Deventer, assignor to Splitdorf Electrical Co., Newark, N. J. Ignition dynamo supplies and carries spark gap of radio signaling apparatus.

1,186,270. Means for Controlling Electric-Heater Circuits. A. F. Berry, assignor to General Electric Co. Schenectady, N. Y. Switching arrangement. (See cut.)

1,186,305. Telephonic System. E. A. Graham, W. J. Rickets and E. A. Sanftleben, Brockley, London, England. Arrangement of circuits having three-wire line between



No. 1,186,270.—Means for Controlling Electric-Heater Circuits.

stations, permitting voice call by transmitter or signal call to be selectively given.

1,186,306. Process of Extracting Metals from Their Ores. W. E. Greenawalt, Denver, Colo. Copper dissolved out by acid and precipitated by hydrogen sulfid, precipitate being electrolyzed to obtain copper and sulfur.

1,186,307. Automatic Alarm for Sprinkler Systems. L. A. Grimes, Orange, N. J. Special fluid-pressure-operated contact device.

1,186,323. Projecting-Lamp. C. A. Matisse and A. C. Matisse, New York, N. Y. Reflector structure.

1,186,335. Electrochemical Amalgamator. S. S. Rose, San Jose, Cal. Manner of making electrical connections in particular structure.

1,186,398. Detectophone. J. E. B. Holladay, assignor to The Holladay Detecto Co., Inc., Suffolk, Va. Arrangement of inductance, receiver and transmitter in circuit.

1,186,407. Direction-Indicator for Automobiles. F. O. Klock, Buffalo, N. Y. Movement of indicating member closes circuit of lamp and audible signal.

1,186,422. Electric Flashlight. J. C. Morgan, Los Angeles, Cal. Has spring-operated generator.

1,186,428. Electric-Light Bracket. H. J. Newman, Cavour, S. D. Number of sockets connected by ball and socket joints.

1,186,439. Machine-Oiler. G. M. Rogers, Chicago, Ill. Solenoid controls oil-feed opening.

1,186,450. Apparatus for Phonographically Recording Telephonically Transmitted Conversations. H. Starcke, assignor to the Firm of Walseck & Starck, Cologne, Germany. Record accomplished without aid of called station.

1,186,454. Miner's Electric Lamp. A. Toler, Berwind, Colo. For securing to cap.

1,186,455. Radiotelephony, Radiotelegraphy and the Like. W. Torikata, Akita, Eitaro Yokoyama, Sakai, and M. Kitamura, Tokyo, Japan. Apparatus for generating high-frequency oscillations.

1,186,459. Electric Apparatus for Driving Clocks or Similar Mechanism. H. E. Warren, assignor to Warren Clock Co., Portland, Me. Has inductively related free and restrained pendulums.

1,186,462. Measured-Service Telephone System. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Assesses tolls of different values.

1,186,464. Telephone-Exchange System. G. Babcock, Rochester, N. Y. Metering arrangements.

1,186,471. Trunk-Selecting Switch. J. Erickson, assignor to Automatic Electric Co., Chicago, Ill. Structure of non-numerical, trunk-selecting switch for telephone system.

1,186,473. Automatic Switch. F. Funke, Independence, Mo. For generator and battery ignition and lighting circuits.

1,186,484. Pay-Station Telephone System. F. Lubberger, assignor to First Trust and Savings Bank, trustee, Chicago, Ill. Subscribers' lines automatically connected but cannot talk before payment, although can talk with switchboard operator.

1,185,494. Synchronizer for Talking-Pictures. J. B. Olinger, Milwaukee, Wis. Phonograph and motion-picture machine driven at approximately synchronous speeds are clutched together on speed variation.

PATENTS EXPIRED.

The following United States electrical patents expired on June 13, 1916:

626,661. Electric-Arc Carbon. D. Bacon, New York, N. Y.

626,667. Electric Sign. C. A. Chase, Chicago, Ill.

626,670. Electrical Burglar-Alarm. C. Coleman, Chicago, Ill.

626,684. Electrical Safe-Protection System. H. F. Freed, Harrisburg, Pa.

626,713. Self-Regulating Dynamo. M. Moskowitz, Newark, N. J.

626,723. Electricians' or Plumbers' Torch. H. C. Roberts, Philadelphia, Pa.

626,769. Apparatus for Electrically Annealing Wire or Rods. J. H. Preston, Joliet, Ill.

626,787. Electrode. W. E. Irish, Cleveland, O.

626,806. Selecting Instrument. A. Duppler, Jersey City, N. J.

626,809. Coin-Controlled Telephone-Register. T. J. Hock and E. Happersberge, San Francisco, Cal.

626,826. Telephone Circuit. P. G. Burgess, Mexico, Mex., and H. W. Wilder, Springfield, Mass.

626,832. Electric Meter. E. S. Halsey, Chicago, Ill.

626,833. System of Electric Metering. E. S. Halsey, Chicago, Ill.

626,835. Electric Block System for Railways. G. Knowles, Milwaukee, Wis.

626,848. Electrical Measuring Instrument. J. Wills, Niagara Falls, N. Y.

626,918 and 626,919. Electrical Switch. P. Medary, Cynwyd, Pa.

626,927. Incandescent-Lamp Socket. C. G. Perkins, Hartford, Conn.

626,940. Electric Cable. W. S. Smith, London, England.

626,942. Magnet Clutch for Brakes. J. B. Stewart, Haverstraw, N. Y.

626,972. Electrolytic Apparatus for Deposition of Metals from Solution. T. Carney, Bay City, Mich.

626,978. Electrical Arm Signal for Railway Crossings. W. H. Danalds, Berea, and A. E. Flickinger, Elyria, O.

626,979 and 626,980. Rail-Bond for Electric Railways. F. H. Daniels, Worcester, Mass.

626,983. Automatic Telephone-Exchange System. W. Decker, Owego, N. Y.

626,984. Combined Alternating Continuous-Current System for Electric Traction. M. Deri, Vienna, Austria-Hungary.

627,006. Electrical Burglar-Alarm System. H. O. Megaard, Chicago, Ill.

627,009. Storage Battery and Method of Preparing Electrodes Therefor. L. Paget, New York, N. Y.

627,054. Electrical Burglar-Alarm System. C. Coleman, Chicago, Ill.